SOV/124-58-4-4875

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 4, p 166 (USSR)

AUTHORS: Tseytlin, V. Z., Volkova, T. I.

TITLE: Investigation of Relaxation Process in Metals by the I. A. Oding Method (Issledovaniye protsessa relaksatsii napryazheniy v metallakh metodom I. A. Odinga)

PERIODICAL: V sb.: Prochnost' metallov. Moscow, AN SSSR, 1956, pp 41-49

ABSTRACT: Some laws governing stress relaxation and factors affecting the process are experimentally investigated by the method of relaxation with the aid of annular specimens as proposed and developed by I. A. Oding in 1944. Results of determination of quantitative characteristics of flexural stress relaxation are presented. The influence of numerous factors, both external (temperature, stress, time) and internal (chemical composition and structural state of the material), affecting the process of relaxation have been studied. Recommendations are tendered as to the content of the alloying elements (Cr, Mo, V) that increase the resistance to relaxation of low-carbon steels for various temperatures. The relationship between relaxation

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Investigation of Relaxation Process in Metals (cont.)

stability and chemical composition of austenite steels was studied. Results of the experiments are compiled in tables and graphs.

Yu. G. Maksimov

1. Metals--Mechanical properties 2. Metals--Chemical properties
3. Metals--Structural analysis 4. Metals--Mathematical analysis

Card 2/2

Tseytlin, V.Z.

137-1957-12-25417

Translation from: Referativnyy zhurnal, Metallurgiya, 1957, Nr 12, p 351 (USSR)

AUTHORS: Tseytlin, V. Z., Volkova, T. I.

TITLE: Employment of I. A. Oding's Method in the Investigation of Stress Relaxation in Metals (Issledovaniye protsessa relaksatsii napryazheniy v metallakh metodom I. A. Odinga)

PERIODICAL: V sb.: Prochnost' metallov. Moscow, AN SSSR, 1956, pp 41-49

ABSTRACT: An analysis of advantages of the ring method of testing metals for relaxation, as proposed by I. A. Oding ["Novyy metod ispytaniya na relaksatsiyu i polzuchest'" (A New Testing Method for Relaxation and Creep), 1949, Book 23, MAShGIZ], and an examination of certain laws governing the relaxation process when this method is employed. It is pointed out that the proposed method deserves wide use and that it may be successfully applied to the development of a theory of stress relaxation in metals, and to an evaluation of the relaxation stability of materials. With this method it is possible to obtain directly quantitative values for relaxation characteristics not only of parts subjected to bending, but also of parts operating under tension, such as bolts and dowels of boilers and turbines.

Z. F.

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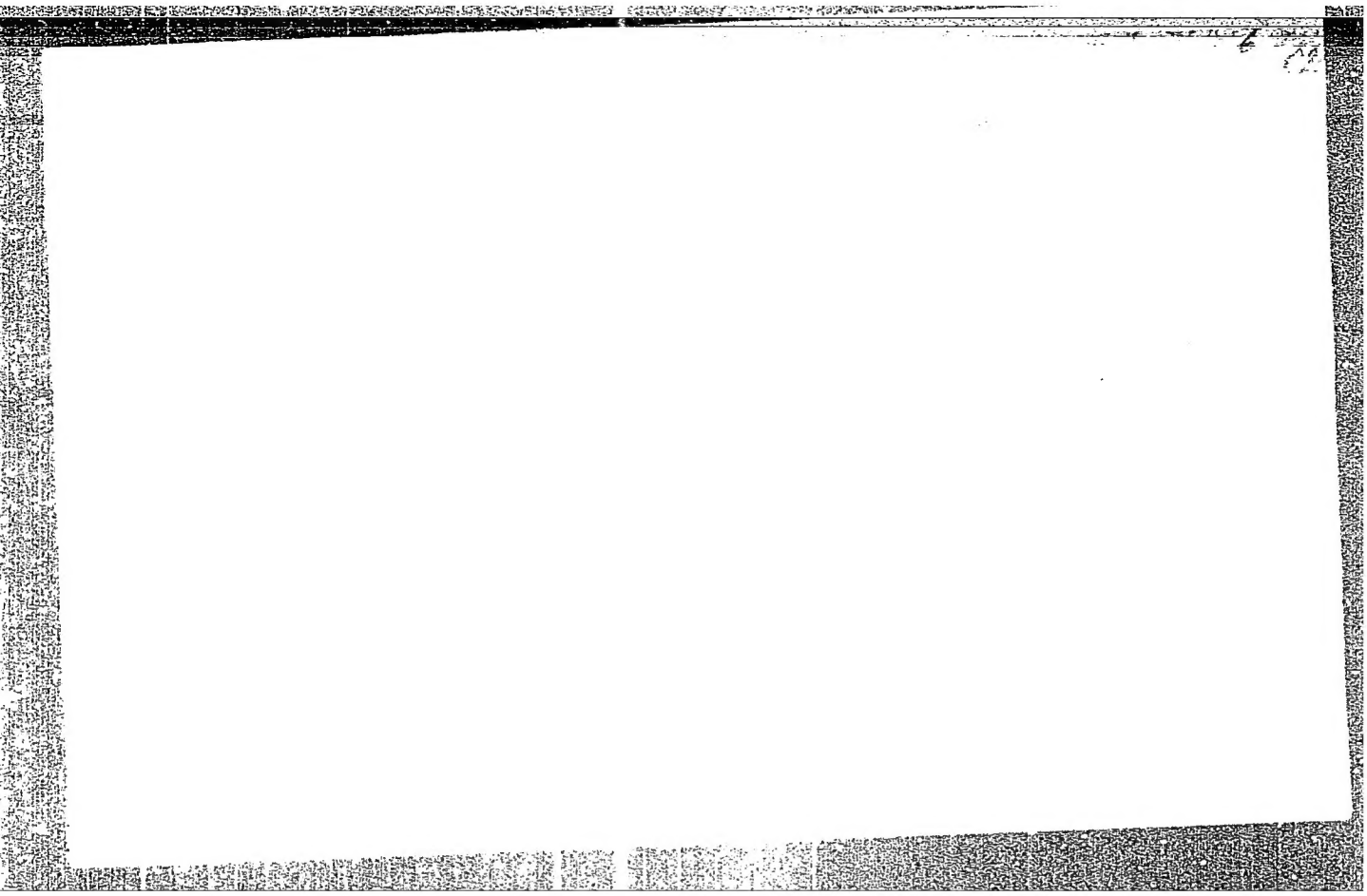
1. Metals-Stress analysis



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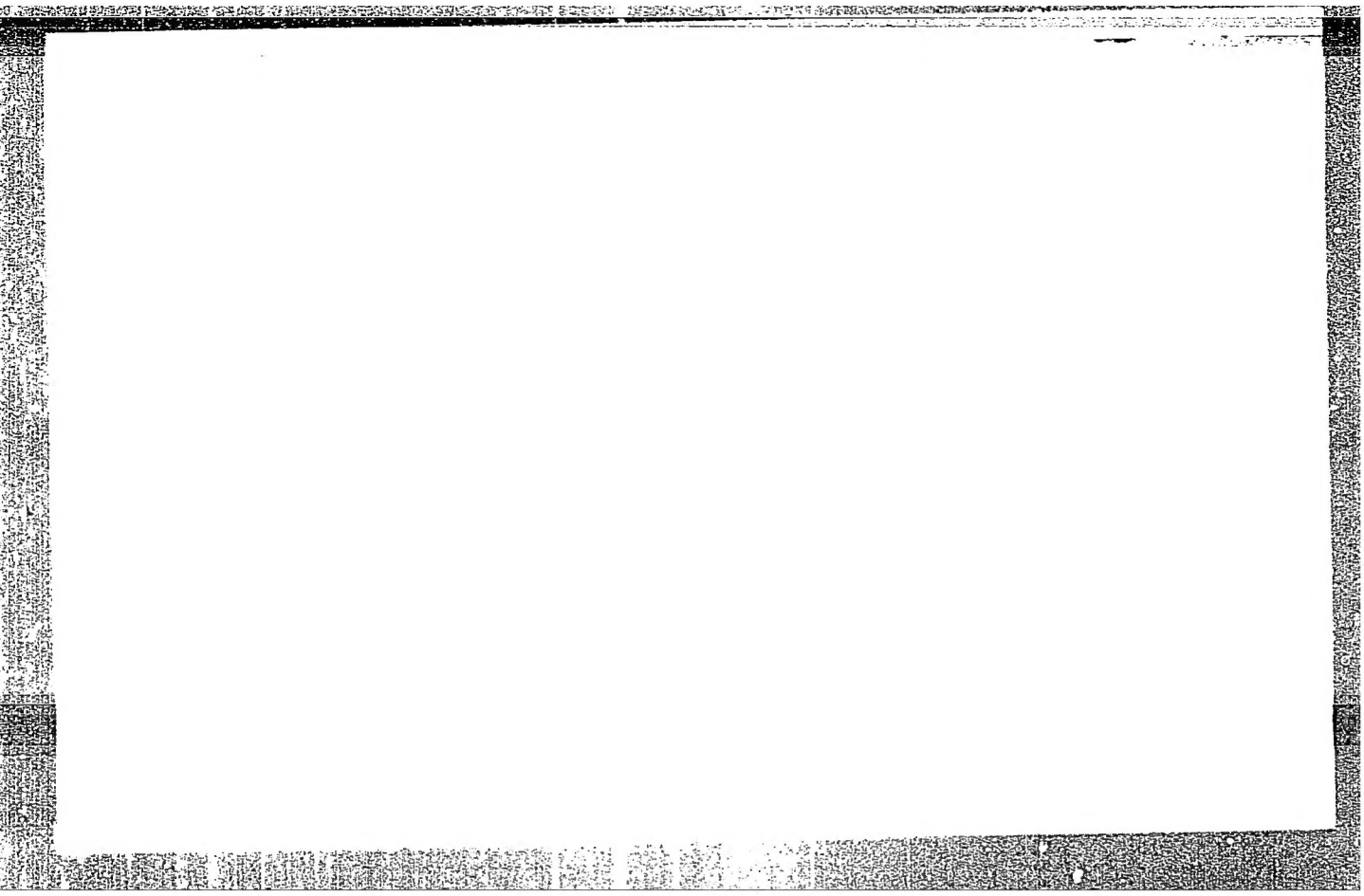

TSEYTLIN, V.Z.

PETROPAVLOVSKAYA, Z.N., kandidat tekhnicheskikh nauk; TSEYTLIN, V.Z., kandidat tekhnicheskikh nauk.

Investigating the properties of EI723 (TsZh-4) steel. Metalloved. i obr. met. no.12:17-27 D '56. (MLRA 10:2)

1. TSentral'nyy nauchno-issledovatel'skiy institut tyazhelogo mashinostroyeniya.
(Steel--Testing)

Tseytlin, V.Z.

USSR/Solid State Physics - Mechanical Properties of Crystals and Polycrystalline Compounds. E-10

Abs Jour : Referat Zhur - Fizika, No 5, 1957, 11908

Author : Tseytlin, V.Z.

Inst : Central Scientific Research Institute for Technology and Machine Building, USSR.

Title : Third Period of Relaxation of Stresses in Metals.

Orig Pub : Zavod. laboratoriya, 1956, 22, No 7, 845-849

Abstract : The author calls attention to the incorrectness of making an analogy between the third period of creep with the third period of relaxation, as proposed by Gintsburg (Zavod. laboratoriya, 1953, 19, 4). Analyzing the extensive experimental material of the Scientific Research Institute for Technology and Machine Building on stress relaxation curves obtained with a large number of types of steel

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137-58-2-4078

TSEYTLIN, V.Z.

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 2, p 259 (USSR)

AUTHORS: Lashko, N.F., Tseytlin, V.Z.

TITLE: Certain Peculiarities of Medium-carbon Chrome-molybdenum Pearlitic Steel (Nekotoryye osobennosti sredneuglerodistoy khromomolibdenovoy perlitnoy stali)

PERIODICAL: V sb.: Fiz.-khim. issled. austenitn. splavov. Moscow, Mashgiz, 1957, pp 167-171

ABSTRACT: A study was made of two types of chrome-molybdenum steel containing 2 percent Cr and 0.9 percent Mo, one with an 0.5 percent V content and one with no V content. The steel was fused in a high-frequency furnace with a capacity of 12 kg. The ingots were forged into rods which were normalized at 1000° C and tempered for 6-10 hours at 650-740° and for 100 hours at 650°. The phase composition of the steel was investigated by means of a comprehensive physicochemical analysis which involved separating out the surplus phases by chemical means, a chemical analysis of the residue, and a differential X-ray and chemical study of the residue phases. After normalization and tempering at 650° for 10 hours the steel with no V in it was found to

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137-58-2-4078

Certain Peculiarities of Medium-carbon Chrome-molybdenum Pearlitic Steel

possess three phases of varying composition: $(Fe, Cr, Mo)_3C$, $(Mo, Cr)_2C$, and $(Fe, Cr, Mo)_{23}C_6$; the steel with the 0.5 percent V content was found to have two phases: $(Cr, Fe, Mo, V)_7C_3$ and $(V, Mo, Cr)C$. In the steel with no V the $(Fe, Cr, Mo)_3C$ phase was not in evidence after a 100-hour tempering at 650°, which suggests that this phase is metastable. The composition of a stable phase in the steel with no V was not ascertained. In the V-based MeC phase of a V-containing carbon steel the Fe was practically insoluble, the Cr was not very soluble, but a relatively large quantity of Mo could be dissolved therein. A small quantity of V ($\sim$0.5 percent), which was almost wholly combined with the vanadium carbide, exhibited great influence on the phase composition of the steel. Because a significant quantity of the Mo combined with the vanadium carbide, the possibility of formation of Mo_2C was excluded. The remaining C combined in the phase Me_7C_3.

T.F.

1. Steel--Phase studies

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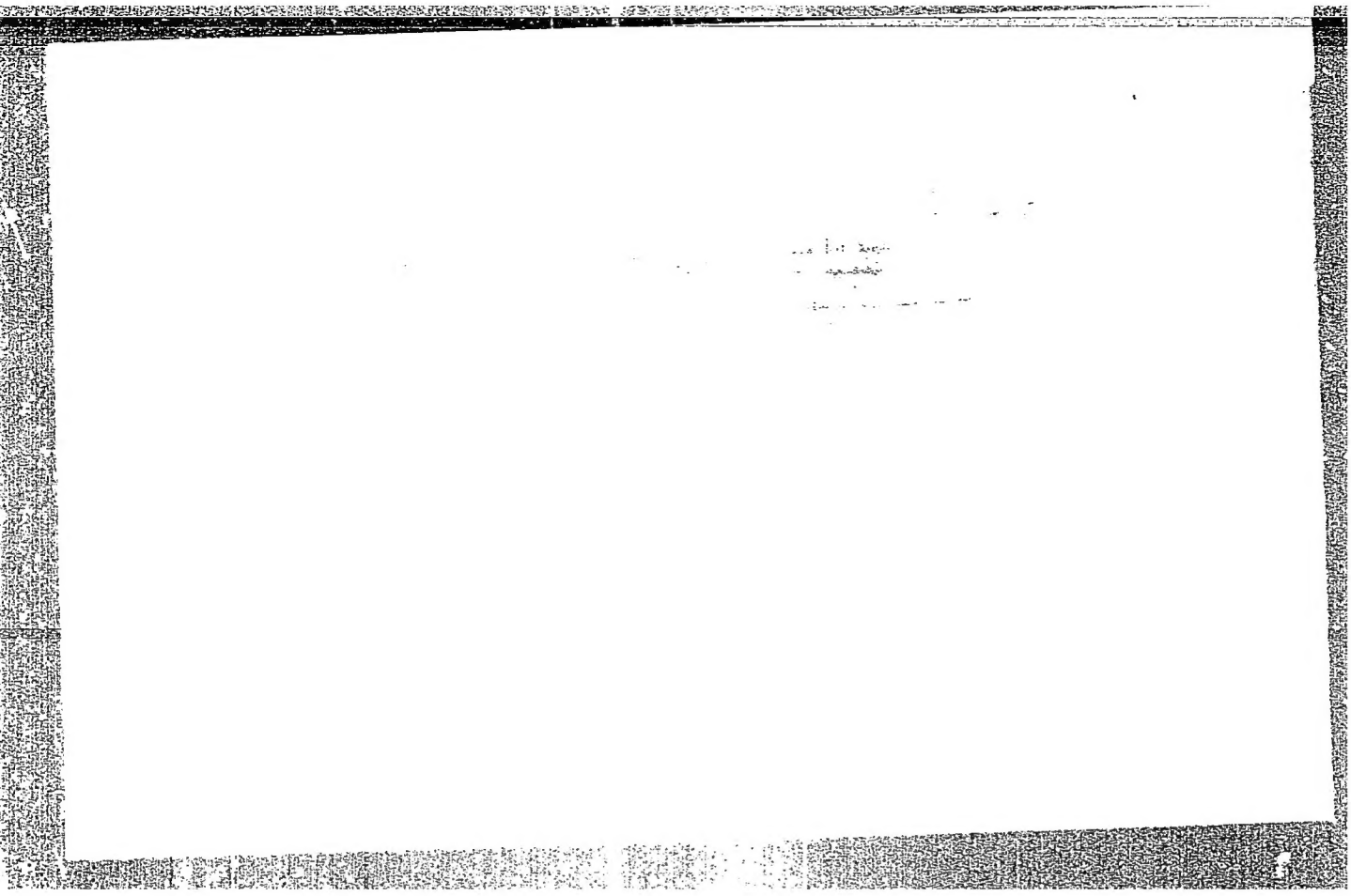

TSEYTLIN, V. Z.

126-1-6/40

AUTHOR: Tseytlin, V. Z.

TITLE: Ferromagnetic phase in austenitic high temperature steels of the type 14-14. (Ferromagnitnaya faza v austenitnykh zharoprochnykh stalyakh tipa 14-14).

PERIODICAL: Fizika Metallov i Metallovedeniye, 1957, Vol.5, No.1, pp. 37-43 (USSR)

ABSTRACT: The results are described of detection of the ferromagnetic phase in high temperature austenitic type 14-14 steels (approximately 14% Ni and 14% Cr). It was established that the high temperature strength of the steel decreases considerably with the appearance of a ferromagnetic phase. The speed of appearance and of cessation of the ferromagnetic phase increases with increasing temperature. The formation of the ferromagnetic phase is associated with concentration changes in the solid solution during carbide formation and its cessation is associated with diffusion processes which lead to equalisation of the concentration. The structure of stainless and high temperature austenitic steels with 18 to 19% Cr and 8 to 9% Ni may contain the ferromagnetic α-phase even directly after hardening in a quantity which depends on the Ni and Cr contents and also on

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Ferromagnetic phase in austenitic high temperature steels of the type 14-14.

the contents of those carbide forming elements which bring about a contraction of the γ-zone. After tempering and also during normal operation, the quantity of the ferromagnetic phase increases and may degenerate into the σ-phase, the existence of which is highly undesirable. The presence of two solid solutions has an unfavourable influence on the properties of steels intended for long duration operation at elevated temperatures. Therefore, for steels intended for steam piping, the nickel content is frequently increased for the purpose of improving the uniformity of the solid solution. Type 14-14 austenitic steels have a more uniform structure of the solid solution and it was assumed for a long time that the solid solution of such steels consists solely of alloyed austenite whatever the state of the steel (hardened, tempered, after operation over long periods). New methods of analysis, particularly the method of magneto-metallographic investigations developed by N. I. Yeremin (Ref.1) showed that under certain conditions a ferromagnetic phase also forms in 14-14 steels but this phase is unstable and its quantity can be controlled by heat treatment. Investi-

Card 2/6 gations made on the steel ЭИ-434, which contains

Ferromagnetic phase in austenitic high temperature steels of the type 14-14.

approximately 14% each of Cr and Ni and 10% Co, yielded the following results: after hardening in oil from 1260°C no signs of a ferromagnetic phase were detected. However, subsequent tempering at 760°C for 20 hours brought about appreciable separations of this phase in the form of a dense network along the grain boundaries and around individual carbides (Fig.1a); if the tempering duration at the same temperature was increased to 50 hours, the network of the ferromagnetic phase was thinner and discontinuous in some spots (Fig.1b) and, after tempering for a total of 100 hours, the network became even more discontinuous and fainter (Fig.1B). Tempering at 800°C for 20 hours produced a discontinuous fine network of the ferromagnetic phase (Fig.1г), whilst after tempering for an equal duration at 850°C, no ferromagnetic phase at all could be detected. These results show that in this steel the ferromagnetic phase is not stable, forms only under certain conditions and decreases with time. By means of magneto-metallographic analysis of the microstructure (carried out by N. I. Lebedyanska) the processes of growth and

Ferromagnetic phase in austenitic high temperature steels of the type 14-14.

reduction of the ferromagnetic phase in the steel ЭИ-434 at 650, 750, 800 and 850°C (after hardening from 1250°C) were watched and the results of these observations are entered in a table, p.38. It can be seen that at each of these temperatures the speed of formation and disappearance of the ferromagnetic phase is different. The graph, Fig.2, shows diagrammatically the increase and the cessation of the ferromagnetic phase; with increasing temperature the maximum of the ferromagnetic phase shifts towards the left, i.e. towards shorter tempering times. A. P. Shishkova (Ref.2) obtained analogous results when studying the fatigue limit of austenitic steels of similar type. In Fig.4 the change of the relaxation strength (residual stress after 4000 hours of loading) at 650°C after hardening from 1200°C and an initial stress of 12 kg/mm^2 is graphed. The author arrived at the following conclusions. The ferromagnetic α-phase may exist not only in the structure of the austenitic steel 19-9 but even in the structure of the more stable 14-14 type steel; in such steel the ferromagnetic phase appears not only during ageing but

Ferromagnetic phase in austenitic high temperature steels of the type 14-14.

also as a result of tempering after hardening and ceases under certain conditions. This phase is detected along the grain boundaries and surrounding individual carbides. Appearance of the α-phase in austenitic steels is linked with diffusion processes of carbide formation and with local concentration changes of the solid solutions in zones directly adjacent to the separating out carbide particles which bring about γ to α transformation. Cessation of the α-phase is due to diffusion processes which equalise the concentration of the solid solution. Appearance of a ferromagnetic α-phase brings about a considerable reduction of the heat resistance in static and cyclic loading. Therefore, it is necessary during heat treatment to select such a tempering temperature and a duration of the tempering at which the α-phase is suppressed completely or at least to a considerable extent; in the case of tempering at 860°C, the α-phase was completely eliminated after 20 hours. The problem of formation of the ferromagnetic phase in an austenitic steel as a result of plastic deformation when non-diffusional γ to α transformation takes place has not

Ferromagnetic phase in austenitic high temperature steels of the type 14-14.

been considered in this paper.
There are 4 figures, 1 table and 4 references, all of which are Slavic.

SUBMITTED: August 29, 1956 (Initially), November 15, 1956 (after revision)

ASSOCIATION: TsNIITMASh.

AVAILABLE: Library of Congress.

Card 6/6

TSEYTLIN, V. Z.

AUTHOR: Tseytlin, V.Z. 32-7-27/49

TITLE: On the Early Period of Relaxation Stress in Metals (O rannem periode relaksatsii napryazheniy v metallakh)

PERIODICAL: Zavodskaya Laboratoriya, 1957, Vol. 23, Nr 7, pp. 846-849 (USSR)

ABSTRACT: Relaxation stress is considered to be the result of two processes: the intergranular and the internal granular process. At present the intergranular processes predominate, the effect of which is decreased by degrees, while the part played by the internal granular processes at the same time gains in importance. For tests carried out according to the method of relaxation investigation annular samples were used, which were subjected to stress by a wedge being pressed into the interior of the ring. An analysis of relaxation curves gave the following results: 1) With a rising temperature in heating the samples of up to 600° the relaxation process takes an active course.
2) The higher temperature rises in the initial period, the more active does relaxation stress become. Relaxation velocity thus increases proportionally to the rise in temperature.
3) The decrease of stress increases proportionally to the increase of initial stress. The method of annular samples was repeated in connection with heating in a hot lead though. The following results were obtained by the investigation: Stress relaxation in the early period is explained by the viscous sliding of the grains along their

Card 1/2

boundaries, so that it appears to be suitable to decrease the number of grains along the boundaries with an increase of the volume of the grains, which can be brought about by thermal treatment of the steel. (It is known that coarse-grained steel shows greater resistance against relaxation than fine-grained steel).
Easily meltable (and disturbing) admixtures of lead, antimony, arsenic, and bismuth should be removed because in this way hardness is increased.
By thermal treatment such a structure should be produced as consists of a small number of the grains of different phases, with, however, the geometrically correct round shape. There are 5 figures.

ASSOCIATION: Central Scientific Research Institute for Technology and Machine Construction (Tsentral'nyy nauchno-issledovatel'skiy institut tekhnologii i mashinostroyeniya)
AVAILABLE: Library of Congress.

TSEYTLIN, V.Z., kandidat tekhnicheskikh nauk.

Effect of molybdenum on relaxation resistance of low-carbon pearlite steel for steam pipes. [Trudy] TSNIITMASH no.79:31-86 '57. (MLRA 10:6)
(Molybdenum) (Steel alloys--Metallography)

~~LASHKO~~ TSEYTLIN, V.Z.

LASHKO, N.F., kand.tekhn.nauk; TSEYTLIN, V.Z., kand.tekhn.nauk

Characteristics of medium carbon chromium-molybdenum steel. [Trudy] TSNIITMASH 84:167-171 '57. (MIRA 10:11)
(Steel alloys--Metallography)

TSEYTLIN, V. Z.

129-1-7/14

AUTHOR: Tseytlin, V.Z., Candidate of Technical Sciences, and Morozova, G.G., Engineer.

TITLE: Change in the Properties of the Nickel-chromium Alloy EI765 for Stationary and Mobile Turbines in the Process of Long Duration (Up to 10 000 Hours) Isothermal Heating (Izmeneniya svoystv nikel'khromovogo splava EI 765 dlya statsionarnykh i transportnykh turbin v protsesse dlitel'nogo (do 10 000 chas.) izotermicheskogo nagreva)

PERIODICAL: Metallovedeniye i Obrabotka Metallov, 1958, No.1, pp. 30 - 35 (USSR).

ABSTRACT: A considerable number of published papers are devoted to nickel-base, particularly nickel-chromium, alloys. In most cases, the experiments were carried out predominantly for short time durations (amounting to a few hundred hours). In this paper, the results are described of observation of the long duration isothermal heating, of up to 10 000 hours, on the properties of the nickel-chromium base alloy EI765 which has a high relaxation strength at 700 - 750 °C. The heat treatment of the alloy consisted of hardening after heating for three hours at 1 150 or 1 200 °C, tempering at 800 °C for 20 hours or at 760 °C for 25 hours. The long-duration isothermal

Card1/5 heating was effected at 700 - 750 °C and the change with time

129-1-7/14

Change in the Properties of the Nickel-chromium Alloy ЭИ765 for Stationary and Mobile Turbines in the Process of Long Duration (up to 10 000 Hours) Isothermal Heating.

was studied of the hardness, impact strength, micro-structure, lattice parameter, phase composition, electric and magnetic properties and the resistance to corrosion in air. The heat resistance was determined predominantly on the basis of the relaxation strength. In Fig.1, the change in hardness, impact strength, specific electric resistance and magnetic susceptibility are graphed for isothermal heating at 750 °C for durations of 10 000 hours. Fig.2 shows the change in the contents of nickel, aluminium, titanium, molybdenum and tungsten in the separated-out phases as a function of the isothermal annealing time. Fig.3 shows the change in the residual stress after 10 000 hours as a function of the test temperature for an initial stress of 25 kg/mm^2. Fig.4 shows the change of the residual stress after 10 000 hours as a function of the initial stress for a test temperature of 700 °C. Fig.5 shows the change of the residual stress as a function of the number of loadings whereby the test duration between the repeated loadings was 1 500 hours. Fig. 6 shows the

Card2/5 relaxation curves for repeated loadings. It was found that

Change in the Properties of the Nickel-chromium Alloy ЭИ765 for Stationary and Mobile Turbines in the Process of Long Duration (up to 10 000 Hours) Isothermal Heating.

each repeated loading to the initial stress increases the relaxation strength; after 6 loadings for 1 500 hours each, the stress can be increased from 14 kg/mm^2 (first cycle) to 23 kg/mm^2 (sixth cycle). The speed of gas-corrosion in air at 700 °C, determined by L.P. Kestel' is very low, amounting to about 0.0011 mm/year. Observations relating to the change in the properties of nickel-chromium alloys alloyed with molybdenum and tungsten, carried out for isothermal hardening at 700 and 750 °C for durations of 10 000 hours (which is equal to the maximum duration of overhaul periods of power plants), permit the following conclusions: alloys of this type have a high stability of their properties for long service lives at 700 to 750 °C. Particularly, the relaxation curves show that the relaxation strength is maintained for periods exceeding the test durations and this also applies, to some extent, to hardness and impact strength. Physico-chemical processes proceed in the temperature range 700 to 750 °C very slowly for the alloys under consideration, the α'-phase in this temperature range is stable and combination of this phase into

Change in the Properties of the Nickel-chromium Alloy ЭИ765 for Stationary and Mobile Turbines in the Process of Long Duration (up to 10 000 Hours) Isothermal Heating.

Ni_3Ti was not observed even after isothermal annealing for 10 000 hours at 750 °C. Some change in the properties of the alloy detected in the interval of 1 000 to 3 000 hours is attributed to dissociation of binary carbides and possibly to changes in the composition of the carbide $Me_{23}C_6$, as a result of which an impoverishment takes place of the separated-out phases in molybdenum and tungsten and an enrichment of these with a solid solution and it is also attributed to processes of coagulation of the α'-phase which is activated at 700 °C after 1 000 hours of heating and at 750 °C somewhat earlier; however, these changes in the properties of the alloy are insignificant and do not affect the relaxation strength of the alloy. The fact that the physico-chemical processes in the studied alloys are slow can be explained by the complicated composition and by the increase in the number of separated-out phases (presence of carbide phases) and also by a complication in the composition and the structure of interacting phases which, according to the views expressed by A.A. Bochvar [Ref. 5],

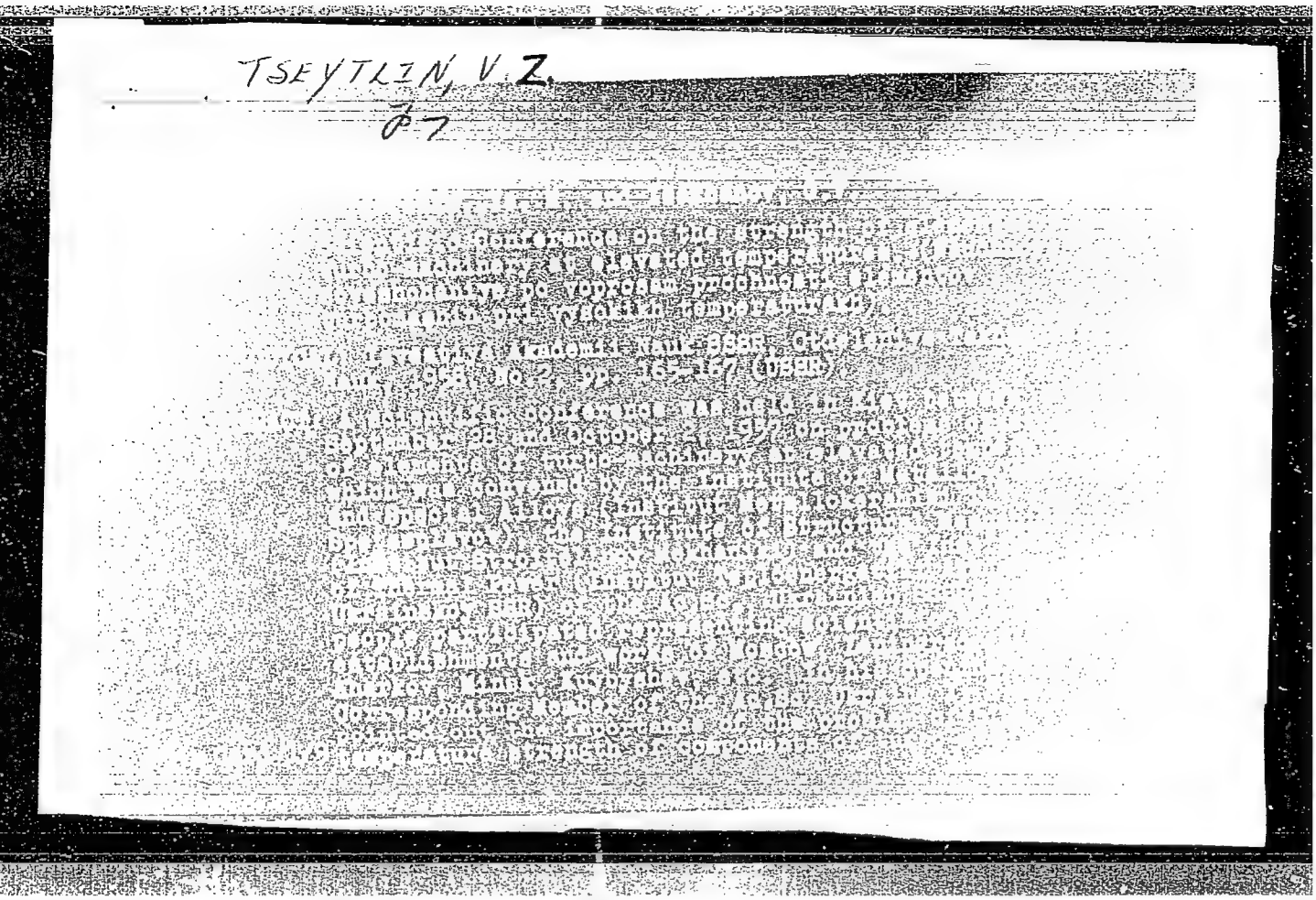
Change in the Properties of the Nickel-chromium Alloy ЭИ765 for Stationary and Mobile Turbines in the Process of Long Duration (up to 10 000 Hours) Isothermal Heating.

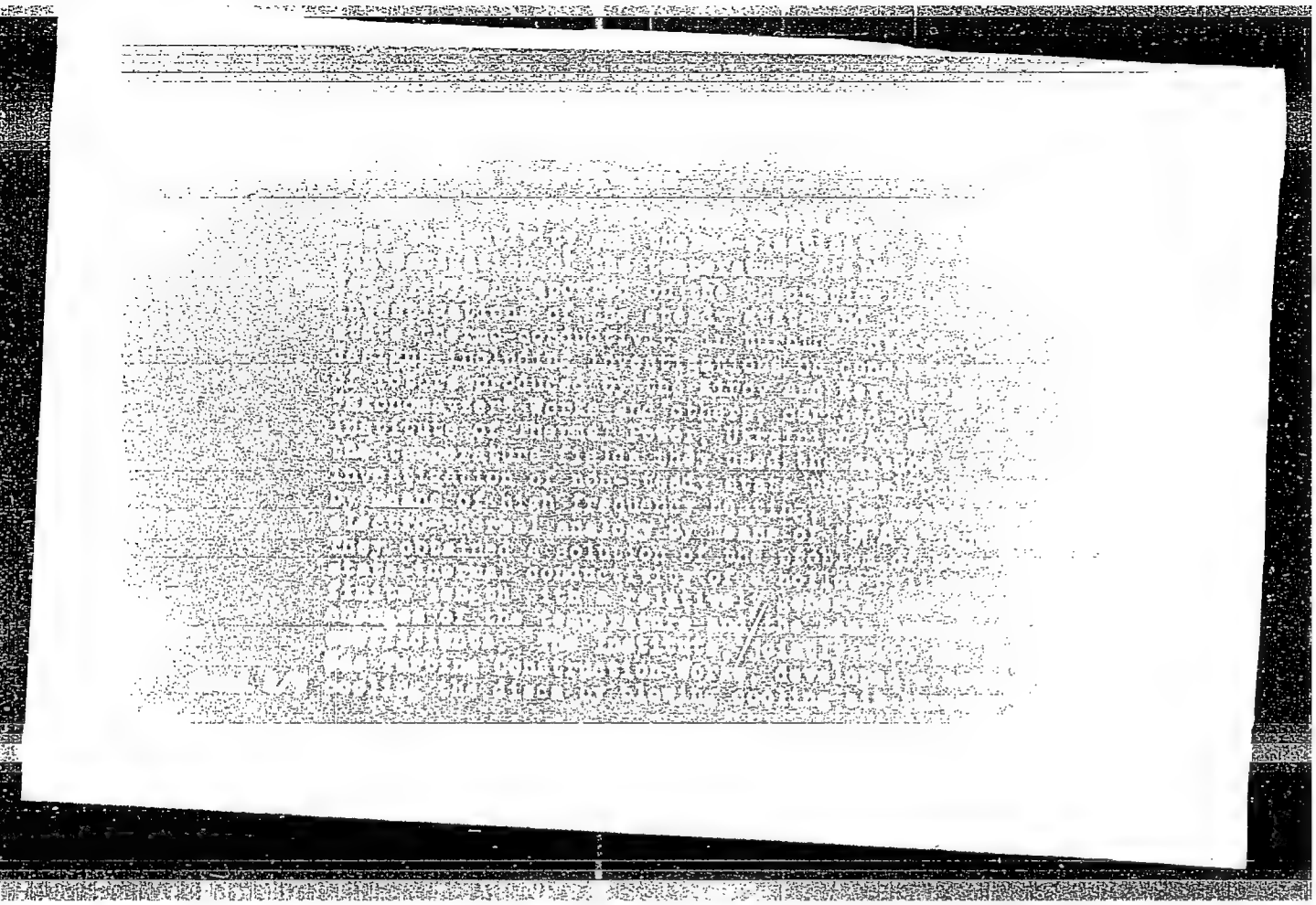
bring about a braking of diffusion exchange processes at the boundaries of division of these phases. M.F. Lesnykh participated in the experimental part of this work. N.F. Karpenko measured the lattice period and took the X-rays of the precipitates and L.A. Nude carried out the chemical analysis of the phases of the precipitates.
There are 6 figures and 5 references, 3 of which are Slavic.

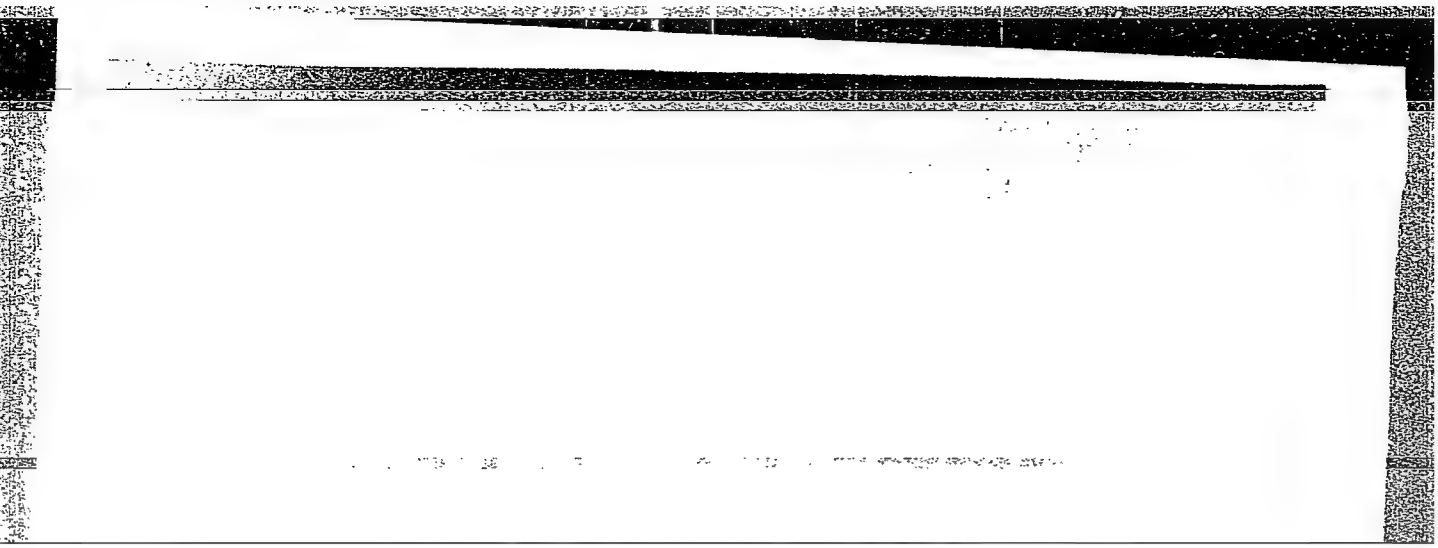
ASSOCIATION: TsNIITMASh.

AVAILABLE: Library of Congress.

Card 5/5







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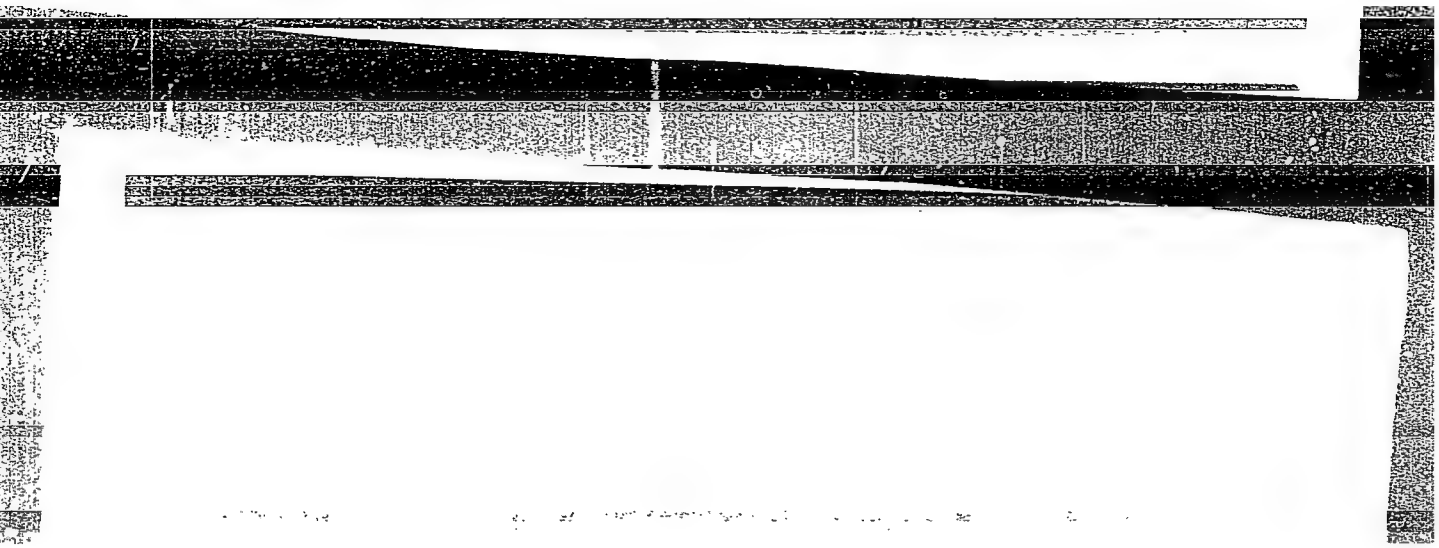

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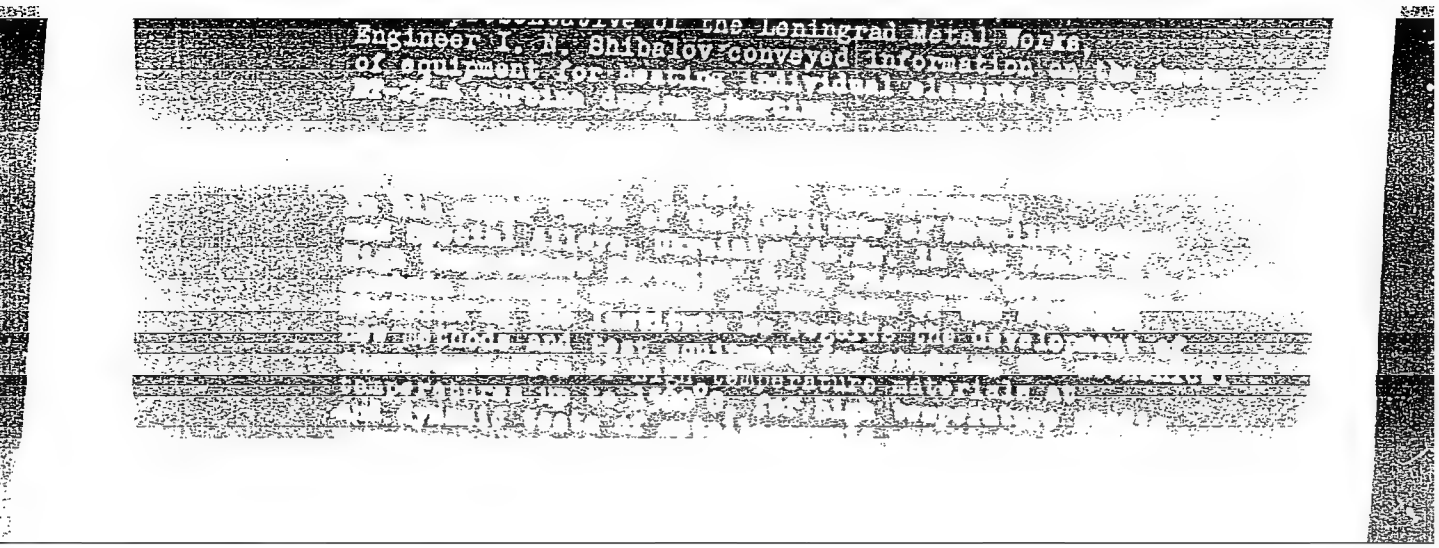

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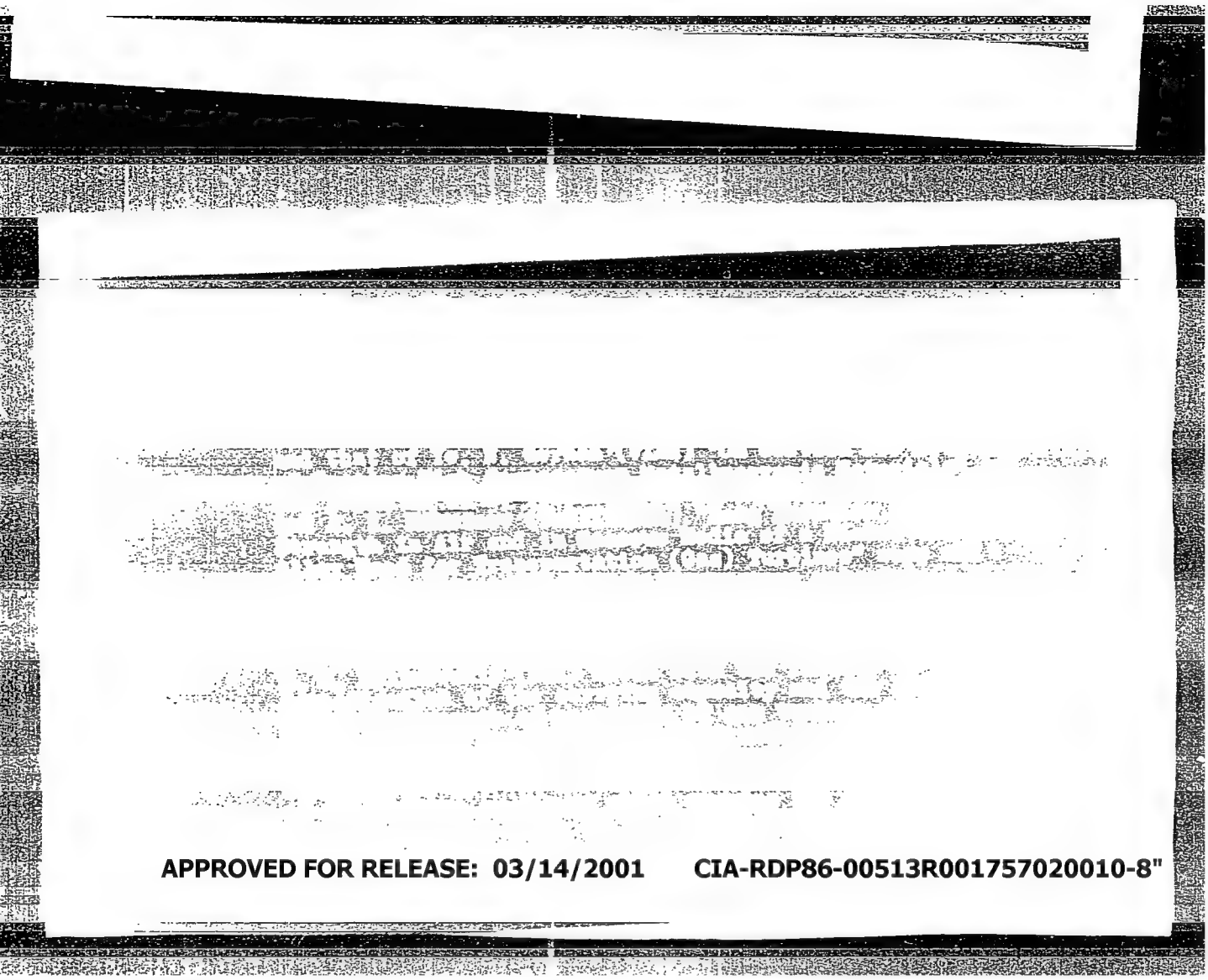

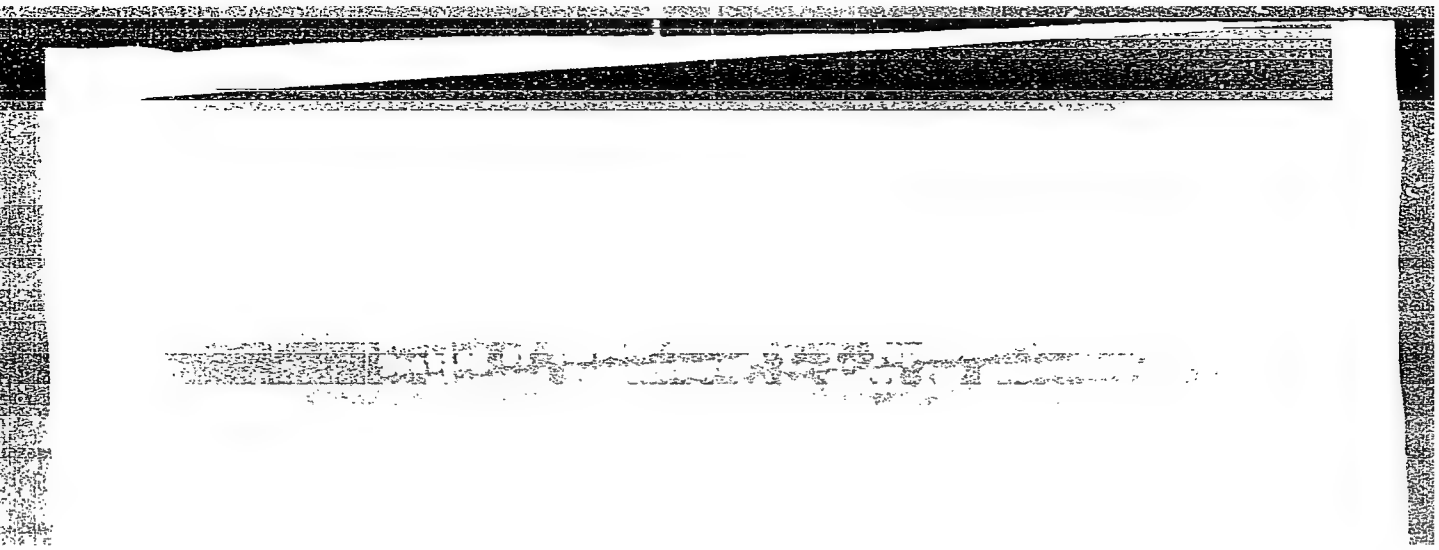

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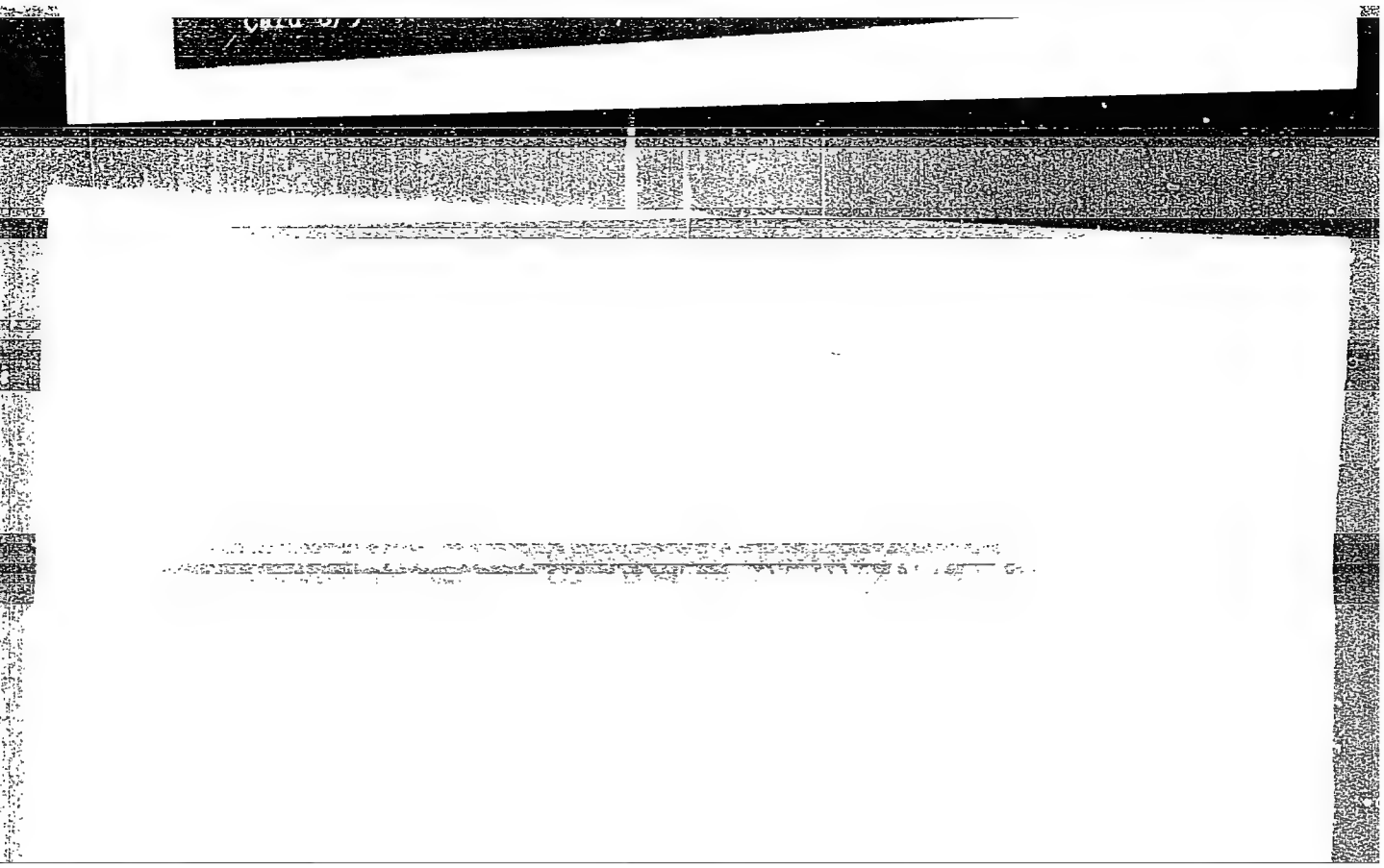

18(2),7(0)

AUTHOR: Tseytlin, V. Z.

SOV/32-25-1-33/51

TITLE: On the Determination of the Plasticity of Heat-Resisting Alloys in Destruction (Ob otsenke plastichnosti zharoprochnykh splavov pri razryve)

PERIODICAL: Zavodskaya Laboratoriya, 1959, Vol 25, Nr 1, pp 87-90 (USSR)

ABSTRACT: The present determination of the plasticity of heat-resisting alloys, which is judged from the extent of relative (conditional) extension, is inaccurate in the case of less elastic alloys where each per cent of residual deformation is important. The plasticity of the EI765 alloy (chrome-nickel base) at 565-650°, for instance, can be wrongly determined (Table) in this way. Maximum deformation is determined more precisely according to the sample contraction since the latter characterizes the degree of deformation of the most strongly deformed part of the sample. Thus the maximum plasticity can be expressed by the equation

$$\psi_K = \frac{F_o - F_K}{F_o} ,$$

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where F_o denotes the initial and F_K the final cross-sectional surface of the sample contraction. The absolute quantity of extension, which is determined by means of the extensometer, permits the plotting of the creep curve in the coordinates "relative contraction - time" (ψ - t) (Fig 1). As this characteristic of plasticity is not commonly known yet the author recommends to apply I. A. Oding's suggestion (Ref 3). Abroad, the plasticity of cast iron is already being determined according to the relative contraction ψ, which indicates the necessity of introducing this term. There are 2 figures and 4 Soviet references.

ASSOCIATION: Tsentral'nyy nauchno-issledovatel'skiy institut tekhnologii i mashinostroyeniya (Central Scientific Research Institute of Technology and Machine-Building)

TSYTLIN, V Z.
P. 3, 6.

18(3) PHASE I BOOK EXPLOITATION SOV/2103

Tsentral'nyy nauchno-issledovatel'skiy institut tekhnologii i mashinostroyeniya

Struktura i svoystva zharoprochnykh materialov; [sbornik] (Structure and Properties of Heat-resisting Materials; Collection of Articles) Moscow, Mashgiz, 1959. (Series: Its: [Trudy] kn. 93) Errata slip inserted. 4,000 copies printed.

Additional Sponsoring Agencies: USSR. Gosudarstvennaya planovaya komissiya and Glavnoye upravleniye nauchno-issledovatel'skikh i proyektnykh organizatsiy.

Ed.: Z.N. Petropavlovskaya, Candidate of Technical Sciences; Ed. of Publishing House: N.A. Ivanova; Tech. Ed.: A. F. Uvarova; Managing Ed. for Literature on Metal Working and Tool Making: R. D. Beyzel'man.

PURPOSE: This book is intended for workers of scientific research institutes and for engineering staffs of plant laboratories of the boiler and turbine industries and power stations. It may also be useful to staff members of higher educational institutions studying problems of physical metallurgy.

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Structure and Properties of Heat-resisting Materials (Cont.) SOV/2103

COVERAGE: This collection of articles describes results of work done at TsNIITMASh on the strength of materials used constantly at high temperatures in power plants. The articles deal with problems of heat resistance, alloying, and the production and heat treatment of heat-resistant steels. The evaluation of properties of industrial materials used under high and ultra-high pressures is given, and modern testing methods are discussed. No personalities are mentioned. References follow several of the articles.

TABLE OF CONTENTS:

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The author investigates the influence of constituents of cast alloys with 25 to 40 percent nickel and approximately 16 percent chrome on the structure and properties at normal and elevated temperatures. Also the influence of small amounts of tungsten, molybdenum, columbium, boron, titanium and aluminum is discussed.

The author presents results of experimental investigation of physical and mechanical properties of alloys of approximately 0.12%C, 68%Ni, 18%Cr, 3.5%Mo, 1.7%Ti, 1.8%Nb, 1.0%Al, 0.8% to 2.8%Cu, and 1.0%Fe. Special emphasis is given to the effect of added copper.

Changes in phase composition of cast Fe-Cr-Ni alloys with approximately 16% Cr and 32% Ni and W, Mo, Nb, Ti and Al as additional agents are investigated. The effect of quenching and tempering temperatures and their time element on the development of the intermetallic compound is discussed.

TSEYTLIN, V.Z.

PHASE I BOOK EXPLOITATION SOV/3559

Akademiya nauk SSSR. Institut metallurgii. Nauchnyy sovet po probleme zharoprochnykh splavov

Issledovaniya po zharoprochnym splavam, t. 5 (Investigations of Heat-Resistant Alloys, Vol 5) Moscow, Izd-vo AN SSSR, 1959. 423 p. Errata slip inserted. 2,000 copies printed.

Ed. of Publishing House: V.A. Klimov; Tech. Ed.: I.F. Kuz'min; Editorial Board: I.P. Bardin, Academician, G.V. Kurdyumov, Academician, N.V. Ageyev, Corresponding Member, USSR Academy of Sciences (Resp. Ed.), I.A. Oding, I.M. Pavlov, and I.F. Zudin, Candidate of Technical Sciences.

PURPOSE: This book is intended for metallurgical engineers, research workers in metallurgy, and may also be of interest to students of advanced courses in metallurgy.

COVERAGE: This book, consisting of a number of papers, deals with the properties of heat-resisting metals and alloys. Each of the papers is devoted to the study of the factors which affect the properties and behavior of metals. The effects of various elements such as Cr, Mo, and W on the heat-resisting properties of various alloys are studied. Deformability and workability of certain metals as related to the thermal conditions are the object of another study described. The problems of hydrogen embrittlement, diffusion and the deposition of ceramic coatings on metal surfaces by means of electrophoresis are examined. One paper describes the apparatus and methods used for growing monocrystals of metals. Boron-base metals are critically examined and evaluated. Results are given of studies of interatomic bonds and the behavior of atoms in metal. Tests of turbine and compressor blades are described. No personalities are mentioned. References accompany most of the articles.

TSEYTLIN, V.Z.

PHASE I BOOK EXPLOITATION SOV/4502

Akademiya nauk SSSR. Nauchnyy sovet po probleme zharoprochnykh splavov

Issledovaniya po zharoprochnym splavam, tom 6 (Investigations of Heat-Resistant Alloys, Vol. 6) Moscow, 1960. 319 p. Errata slip inserted. 3,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut metallurgii imeni A. A. Baykova. Nauchnyy sovet po probleme zharoprochnykh splavov.

Editorial Board: I. P. Bardin (Deceased) Academician, G. V. Kurdyumov, N. V. Ageyev, Corresponding Member, Academy of Sciences USSR (Resp. Ed.), I. A. Oding, I. M. Pavlov, and I. F. Zudin, Candidate of Technical Sciences; Ed. of Publishing House: V. A. Klimov; Tech. Ed.: S. G. Tikhomirova.

PURPOSE: This book is intended for research workers in the field of physics of metals and for metallurgists, particularly those working on heat-resistant alloys.

COVERAGE: This collection of 45 articles deals with various problems in the production of heat-resistant alloys. Special attention is paid to the mechanisms of deformation of such metals as aluminum, copper, iron, and nickel. Various defects and failures of metals are analyzed, and means for increasing the heat resistance and plasticity are described. Among the special problems discussed are: electrolytic conductivity of iron-aluminum alloys in the solid state; the mobility of atoms in nickel-iron alloys, depending upon defects of their crystalline structure; the kinetics of change in isolated pores; the irreversible thermal transformation of solid bodies, etc. No personalities are mentioned. References follow each article.

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TSEYTLIN, V.Z., kand.tekhn.nauk

Principles for the selection of metals for fastening parts of boilers and turbines. [Trudy] TSNIITMASH 100:248-258 '59. (MIRA 13:7)

(Steam turbines) (Metals--Thermal properties)
(Boilers)

TSEYTLIN, V.Z., kand.tekhn.nauk; FILATOVA, M.A., inzh.; RYABCHENKOV, A.V., doktor khim.nauk prof.; MAKSIMOV, A.I., inzh.

Investigating the properties of the pilot-plant produced EI765 alloy used for manufacturing gas turbin parts. [Trudy] TSNIITMASH 100:192-217 '59. (MIRA 13:7)
(Heat-resistant alloys)
(Gas turbines)

MIRKIN, I.L.; TSEYTLIN, V.Z.

Effect of constitutional equilibrium on heat resistance. Issl. po zharopr. splav. 6:268-277 '60. (MIRA 13:9)
(Heat-resistant alloys) (Phase rule and equilibrium)

89670

18.8100 2808 1045 1418

S/129/61/000/002/001/014
E193/E483

AUTHORS: Mirkin, I.L., Doctor of Technical Sciences, Professor and Tseytlin, V.Z., Candidate of Technical Sciences

TITLE: The Structural State and High-Temperature Strength of Alloys

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov, 1961, No.2, pp.2-11

TEXT: Based mainly on previously published works of both Soviet (including the present authors) and foreign researchers, this is an exposition of the present state of knowledge of the relationship between the high-temperature strength of alloys and various features of their structure and constitution. It is pointed out that at temperatures near the melting point, where diffusion processes play the predominant part and where quasi-viscous flow of the metal takes place, the chemical nature of the alloy which governs the strength of the atomic bonds of the alloy matrix is the main factor determining the resistance to deformation and fracture. However, at temperatures far below the melting point of the alloy, its high-temperature strength depends mainly on its structural state; in the case of components operating under stress

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The Structural State and High-Temperature Strength of Alloys

at high temperatures for long periods of time (up to several hundred thousand hours), the kinetic factor determining the ability of the alloy to retain its initial structural state plays also an important part. Alloys, in which processes of diffusion, coalescence and interaction between their constituents take place at a relatively slow rate, retain their high-temperature strength for a relatively longer time and are characterized by relatively slower rates of creep and relaxation. The initial structural state of an alloy depends on the composition and constitution of the solid solution matrix and other phases present and also on the distribution of these phases and interaction between them. The high-temperature strength can be imparted to a solid solution only by the introduction of alloying elements which increase the strength of the atomic bonds, slow down the rate of diffusion (particularly self-diffusion) processes, raise the recrystallization temperature of the solid solution and increase its resistance to shear. Introduction of several alloying elements (e.g. Mo, W, Cr, Co etc.) is more effective than a large addition of one element only.

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The Structural State and High-Temperature Strength of Alloys

If, however, the alloying additions are to perform their function, they have to be present in concentration higher than their solid solubility limit. This is illustrated on the example of a nickel-chromium alloy, containing 5% Mo + W and 3% Fe, whose relaxation stability at 700°C was increased twofold after its niobium content had been increased from 2 to 4%, the latter figure being higher than the solid solubility limit of niobium in this alloy. Another example is provided by the age-hardenable nickel-chromium alloys, containing aluminium and titanium. When solution-treated alloys of this type are tested at high temperatures, their strength remains relatively low until the beginning of the precipitation of a second phase, the rate of deformation in the initial stage of the test for solution-treated alloy being three times higher than that of age-hardened specimen. The results of experiments conducted in the laboratories with which the present authors are associated, where a large number of Ni-Cr alloys and austenitic steels containing 8 to 40% Ni wit some other alloying elements have been

The Structural State and High-Temperature Strength of Alloys

studied, have confirmed the view that satisfactory high-temperature strength is possessed only by heterogeneous alloys and steels, or by super-saturated solid solutions in which second phases can be precipitated at elevated temperatures. The importance of this factor is illustrated on the example of an Fe-base alloy, containing 16% Cr and 32% Ni with and without Mo and W additions, present in various concentrations. The time-to-rupture τ at 700°C under the applied stress of 12 kg/mm^2 was determined for these alloys: the proportion of the precipitated phases (whose composition corresponded to the general formula $Me_{23}C_6$ and $Me_n'.Me_n''$ C) present in these alloys and separated by electrolytic dissolution of the specimens, was measured. The results are reproduced in Fig.3, where τ(h) is plotted against % of the insoluble residue representing the intermetallic compounds present in the alloys studied. At the same, chemical and structural heterogeneity of a solid solution may adversely affect its resistance to plastic deformation. Thus, the high-temperature strength of austenitic

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(18Cr - 8 Ni) steels is considerably reduced in the presence of free ferrite. Precipitation of the ferromagnetic α-phase can also take place in a homogeneous steel, containing 14% Cr and 14% Ni, with the subsequent deterioration of the high-temperature strength and relaxation stability. All other factors being equal, the long-term high-temperature strength of an alloy at sufficiently high temperatures and low magnitude of applied stress increases with increasing grain size of the initial structure. This effect can be attributed to the fact established by Rachinger (Ref.7) who has found that at sufficiently high temperatures (higher than 250°C), 85% of total deformation of aluminium takes place along the grain boundaries, which means that with decreasing total grain-boundary area, the possibility of plastic deformation by movement of atoms in the grain-boundary regions decreases. The high-temperature properties of alloys are affected not only by the total area of the grain boundaries, but also by the nature of their structure. According to Mott (Ref.6), the lower the degree of lattice distortion of the grain boundaries and the stronger the

The Structural State and High-Temperature Strength of Alloys

atomic bonds of this lattice, the higher are the resistance of the grain boundaries to deformation, their high-temperature strength and, particularly, their plasticity. In the case of steels, the chemical nature of the precipitated phases is the factor governing their high-temperature properties. If the service temperature exceeds a certain critical level, it may be necessary to change the chemical composition and/or crystal lattice structure of these phases for the steel to retain its high-temperature strength. Thus, in materials designed to operate at 550 to 570°C, alloyed cementite plays the predominant part in imparting to steel its high strength, carbides of the alloying elements being of secondary importance. However, at higher temperatures, the iron-base carbides cannot ensure satisfactory high-temperature strength of the steel. At temperatures between 570 and 700°C, chromium carbides are the essential strength-imparting phases; they consist mainly of trigonal Me_7C_3 (at 580 to 600°C) and cubic $Me_{23}C_6$ (at 600 to 650°C) carbides. At temperatures higher than 750°C, the carbide phases are less effective in imparting the high-temperature strength

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than other intermetallic compounds, and alloys based on metals other than iron have to be used in this temperature range. Thus, for instance, the predominant part in imparting the high-temperature strength to Ni-Cr alloys at 750 to 900°C is played by a phase of the $Ni_3(Al,Ti)$ type. In the next paragraphs, the authors discuss in greater detail the part played in steels by various alloying additions. They point out that in steels designed to operate at 300 to 350°C, the attainment of satisfactory strength can be ensured by the presence of unalloyed cementite alone. If the service temperature is raised to 400 to 450°C, chromium and/or molybdenum have to be introduced. These elements are present not only in the solid solution matrix but are capable of replacing some of the iron atoms in cementite; they increase the strength of the atomic bonds and inhibit diffusion processes which accelerate coalescence of carbides and may lead to decomposition of cementite and to the formation of free graphite. In this respect, steels containing both chromium and molybdenum are better than those containing one of these elements only, it having been found that

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The Structural State and High-Temperature Strength of Alloys

free graphite can be precipitated after long periods at 500°C in a steel containing molybdenum alone. When molybdenum is the only alloying element, it diffuses slowly during service at elevated temperatures from ferrite to carbides, as a result of which the high-temperature strength of steel decreases. (It has been shown by Mirkin and Solonouts (Ref.13) that in the case of steel 15 M, operating at 500°C for 15000 to 25000 h, between a quarter and a half of molybdenum dissolved originally in ferrite has diffused into carbides.) At still higher temperatures it is necessary to ensure the formation of more complex carbides by addition of elements such as vanadium. These elements should be added in quantities sufficient for the formation of carbides not only of the Me_3C type, but also those corresponding to the formula MeC. It has been established that, in the case of pearlitic steels, better high-temperature strength is attained if the ferrite-carbide mixture is formed without the preliminary martensitic transformation. According to Bochvar (Ref.14), this effect can be attributed to the fact that in finely-granular pearlite formed as a result of

The Structural State and High-Temperature Strength of Alloys

decomposition of martensite, the number of regions that can simultaneously undergo plastic deformation is larger than that in lamellar pearlite. It has been established also, by Tseytlin (Ref.17), that a chromium-nickel-vanadium steel, tempered after air-hardening treatment, has better high-temperature strength than that tempered after normal hardening treatment, this effect having been attributed to a more favourable distribution of the alloying elements between ferrite and carbides attained by the former treatment. Apart from the initial structural state, the structural stability of the alloy at high temperatures is also very important. Thus, for instance, in the case of steel 12X12B4MF (12Kh12V4MF), ageing for 3000 h at 600°C causes the formation of the $M_A(M_B)_2$ phase which, after 500 h at the temperature, becomes the predominant phase and brings about an increase in the rate of deformation (Ref.19). Similarly, the rate of deformation of an Fe-base alloy, containing 20% Cr, 20% Ni and 20% Co, decreased sharply after 6000 h at 600°C, owing to a corresponding decrease in the rate of precipitation of a carbide phase corresponding to a

The Structural State and High-Temperature Strength of Alloys

general formula $Me_{23}C_6$. Finally, the high-temperature properties of alloys operating under conditions of prolonged loading depend to a large extent on the kinetics of phase transformations and, particularly, precipitation of second phases. In order to slow down these processes, it is desirable to slow down the rate of diffusion, particularly in alloys undergoing creep and relaxation. However, the coefficient of probability of concentration fluctuations is an equal, and often more important, factor. According to Mirkin (Ref.21), the fluctuation theory provides an explanation of the sharp decrease in the rate of precipitation of second phases, brought about by the introduction of several alloying additions and by increasing the difference between the composition of the matrix and the precipitated phases. Thus, for instance, when chromium-bearing carbide is being precipitated instead of unalloyed cementite, the number of carbide nuclei decreases by 2 to 4 orders of magnitude; when a ternary carbide is being precipitated, the number of these nuclei is decreased by several orders of magnitude. There are 11 figures and 21 references: 15 Soviet and 6 non-Soviet.

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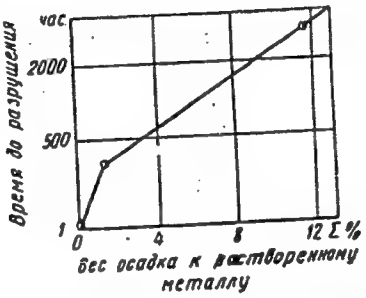
The Structural State and High-Temperature Strength of Alloys

ASSOCIATION: TsNIITMASh

Fig.3.



Фиг. 3. Изменение времени до разрушения сплава с 16% Cr и 32% Ni (при переменном содержании Mo и W) в зависимости от увеличения веса электролитически выделенного осадка. Фазы выделения $Me_{23}C_6$ и $Me'_n\ Me''_n\ C$, 700°, 12 кг/мм².

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28882
S/590/61/101/000/001/015
D217/D304

/ 18.8200
24.4200

AUTHORS: Mirkin, I.L., Doctor of Technical Sciences, Professor
Tseytlin, V.Z., Candidate of Technical Sciences, and
Morozova, G.G., Engineer

TITLE: Internal friction and modulus of slip of some pure metals used as constituents of refractory alloys

SOURCE: Moscow. Tsentral'nyy nauchno-issledovatel'skiy institut tekhnologii i mashinostroyeniya. [Trudy] v. 101, 1961. Issledovaniye novykh zharoprochnykh splavov dlya energetiki, 34 - 48

TEXT: A study of the temperature dependence of internal friction and modulus of slip for pure Ni, Al and Mo by means of low frequency torsional oscillations was carried out, using a modified Ke apparatus known as РКФ -2 (RKF-2). The modification was carried out by the Kafedra fiziki Instituta stali (Physics Department of the Steel Institute). By means of this instrument, the temperature dependence of internal friction and the modulus of slip of the sa-

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Internal friction and ...

me specimen can be measured under vacuum. A vacuum of 1.10^{-3} to 10^{-4} mm Hg was maintained for the tests. The logarithmic decrement was taken as a measure of internal friction. The modulus of slip was proportional to the square of the frequency of free torsional oscillations of the specimen; the coefficient of proportionality depended only on the geometry and distribution of the masses in the system participating in the torsional oscillations. The specimens were wires, 300 mm long and having a diameter of 0.8 mm. The natural frequency of torsional oscillations of the specimen in all measurements was between 0.4 and 2 cycles/sec. The logarithmic decrement was determined by observing consecutive amplitudes of oscillation within a definite period of time. In all measurements and at all temperatures, the maximum amplitude of oscillation was less than 8 cm. For the wire specimens investigated, this amplitude corresponded to the maximum deformation by slip on the wire surface. An analysis of the results has led to the following conclusions: 1) The curve for the temperature dependence of internal friction of nickel exhibits three peaks: a) a low-temperature peak

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Internal friction and ...

at between 100 and 200°, due to the ferromagnetic striction phenomenon; b) a medium temperature peak between 300 and 400° (or 400-500° under different conditions of annealing), due to stress relaxation along the grain boundaries during viscous slip of the grains c) a high-temperature peak between 700 and 800°, when measuring internal friction whilst annealing heavily deformed nickel; the nature of this peak is not yet fully understood. 2) Annealing heavily deformed nickel decreases internal friction. Increasing the annealing temperature from 500-950° results in an increase of the temperature of the medium-temperature peak, and only a further increase in annealing temperature to 1200° brings about a decrease in peak temperature. 3) The temperature dependence of the modulus of slip at room temperature is similar to that of the Curie point; this is due to the ferromagnetic striction. 4) Only one peak is observed on the temperature dependence of internal friction curve for Al at between 100 and 200°; this is caused by relaxation of stresses along the grain boundaries. 5) An increase in grain size with rise in annealing temperature lowers the height of the peak, since a decrease in the total length of boundaries decreases the

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Internal friction and ...

intensity of processes occurring along the grain boundaries. 6) No peaks are observed on the temperature dependence curve for Mo on heating to 900°. 7) The temperature range in which the internal friction curve begins to rise is greatest for Mo and lowest for Al. However, at comparable temperatures (T/T_{MP}), this range can be considered approximately constant for all three metals (T/T_{MP} = 0.33-0.40). There are 11 figures, 1 table, and 8 references: 7 Soviet-bloc and 1 non-Soviet-bloc. The reference to the English-language publication reads as follows: S. Siegel and S. Onimby, Dependence of Young's modulus for nickel upon temperature and magnetization, "Physical Review", 49, 663, 1936.

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S/137/62/000/006/095/163
A160/A101

An investigation of the...

(RKF-MIS) apparatus. Presented are the curves of Q^{-1} and f^2 of the alloys in relation to the temperature. A great effect of the content of Al and Cr in Ni on the temperature relations of Q^{-1} and f^2 was noted. The low-temperature peak of Q^{-1} shifted to lower temperature ranges and completely disappeared at 5% Al and 9.5% Cr. This is caused by losses of the magnetic properties of Ni when alloyed with Al and Cr. Also observed was a decrease or disappearance of the anomaly in the temperature dependence of the shear modulus during alloying, which was due to the ΔE-effect. The rise of the Q^{-1} curves and the high-temperature peak of internal friction shifted by 200 - 400°C to higher temperature ranges during alloying. This is explained by an increase of the bond strength in the solid solution lattice during alloying within the given limits.

A. Babareko

[Abstracter's note: Complete translation]

Card 2/2

MIRKIN, I.L., doktor tekhn.nauk, prof.; TSEYTLIN, V.Z., kand.tekhn.nauk; MOROZOVA, G.G., inzh.

Investigating the aging process in nickel alloys by changes in the temperature relation of internal friction. [Trudy] TSNIITMASH 101:61-79 '61. (MIRA 14:10)
(Nickel alloys--Metallography)
(Internal friction)

S/137/62/000/007/040/072
A057/A101

AUTHOR: Tseytlin, V. Z.

TITLE: Conditions of formation of the ferromagnetic phase in austenitic chrome-nickel steel

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 7, 1962, 23, abstract 7I141 (In collection: "Issled. novykh zharoproch. splavov dlya energetiki". Moscow, Mashgiz, 1961, 100 - 110)

TEXT: The effect of a decrease of the C content on carbide formation, and also the effect of the Ni content on kinetics of the formation of the α-phase in Cr-Ni-steels of four compositions (in %): Cr 15 - 14.8, Ni 10.8 - 24, C 0.15 - 0.08 was investigated. The forged rods were quenched in water from 1,150°C and tempered from 1 to 1,000 hrs at 600, 700 and 800°C. Magneto-metallographic analysis according to the method of N. I. Yeremin was made with finished sections after thermal treatment. It is demonstrated that in steel with 0.15% C an increase of the Ni content from 10 to 15% inhibits the formation of the ferromagnetic α-phase during the tempering process and narrows down the range of tem-

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Conditions of formation of...

perature and time of presence of the α-phase. The latter was not observed after tempering at 800°C in the steel with 15% Ni. In the alloy with 10% Ni the α-phase appears at 800°C already after one hour. With 25% Ni no formation of α-phase occurs. The diminution of the C content from 0.15 to 0.08% at 15% Ni effected that the α-phase was not formed. It is assumed that the α-phase forms in Cr-Ni-steels due to the separation of carbides and the resulting concentration changes in the solid solution.

A. Rabin'kin

[Abstracter's note: Complete translation]

Card 2/2

S/032/61/027/001/017/037
B017/B054

AUTHORS: Trunin, I. I., Tseytlin, V. Z., and Zeytman, G. I.

TITLE: Effect of Interruptions on Stress-rupture Tests

PERIODICAL: Zavodskaya laboratoriya, 1961, Vol. 27, No. 1, pp. 66-71

TEXT: The authors tested the effect of periodic interruptions on stress-rupture tests of the following steels and alloys: IX18N9T (IKh18N9T), EI 723 (EI 723)(0.22-0.33% C, 2.1-2.5% Cr, 0.90 - 1.10% Mo, 0.3-0.5% V), EI 765 (EI 765)(0.09% C, 14.5% Cr, 1.3% Ti, 5.2% W, 4.2% Mo, 1.94% Al, 0.08% B, balance Ni), and nickel-chromium alloys in a highly plastic state. Interruption of the stress-rupture endurance test during which the specimen was cooled to room temperature, and then held at this temperature for 24 hrs, had little effect on the course of the curves. A significant effect, however, was produced on specimens that had not been cooled before. IX18N9T (IKh 18N9T) and EI 765 (EI 765) steel specimens were destroyed at the grain boundaries. Most of the materials which had been cooled previously withstood up to 14 interruptions. Only EI 723, which possesses a very high ductility in continuous tests (average reduction of area of 55.8%), showed

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Effect of Interruptions on Stress-rupture Tests

S/032/61/027/001/017/037
B017/B054

lower ductility in interrupted tests. A considerable effect of interruptions on rupture life can be expected in cases where total elongation in continuous tests does not exceed 1%, and when sudden shocklike load removal occurs. Engineer T. A. Bugrov and Senior Technician M. F. Lesnykh (TSNIITMASh = Central Scientific Research Institute of Technology and Machine Building) assisted in the tests. There are 6 figures, 1 table, and 4 references: 3 Soviet and 1 German.

ASSOCIATION: Tsentral'nyy nauchno-issledovatel'skiy institut tekhnologii i mashinostroyeniya (Central Scientific Research Institute of Technology and Machine Building), Taganrogskiy zavod "Krasnyy kotel'shchik" (Taganrog "Krasnyy kotel'shchik" Plant)

Card 2/2

IVANOV, O.S., doktor khim.nauk; TSEYTLIN, V.Z., kand.tekhn.nauk; GOMOZOV, L.I., kand.tekhn.nauk; LARIONOV, V.V., inzh.

Hardness of niobium-molybdenum alloys at temperatures up to 1600°. Metalloved. i term. obr. met. no.7:4-7 Jl '62. (MIRA 15:6)

1. Institut metallurgii im. A.A. Baykova i Moskovskiy vecherniy mashinostroitel'nyy institut.
(Niobium-molybdenum alloys—Testing)
(Metals at high temperatures)

S/590/62/105/000/013/015
I031/I242

AUTHORS: Tseytlin, V.Z., Candidate of Technical Sciences and Filatova, N.A., Eng.

TITLE: Effect of varying content of aluminum and titanium on some properties of Ni-Cr-Al-Ti alloys

SOURCE: Moscow. Tsentral'nyy nauchno-issledovatel'skiy institut tekhnologii i mashinostroyeniya. Trudy. v.105, 1962, 190-196

TEXT: Aluminum is the chief element, beside nickel, which influences the formation of a hardening intermetallic α' phase. Its presence favors an increase in the number of crystals and thus retards their coagulation. Titanium dissolves in large

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S/590/62/105/000/013/015
I031/I242

Effect of varying content of ...

amounts of aluminum, and in nickel it forms the intermetallic phase Ni_3Ti. Twelve Ni-Cr-Al-Ti alloys with Al content varying from 2 to 4% and Ti- from 0 to 1.5% were tested. The hardness and short-term tensile properties improved with the increase of the Al content from 2 to 4%, while the Ti content remains under 1%. At the same time a loss in ductility and impact strength was observed. An increase of Al content from 2 to 4% improved the relaxation characteristic, while no effect of Ti contained in an alloy with 3-4% Al could be observed. An increase in Al and Ti content generally improves the stress-rupture behavior. The effect of Al is much more marked, as the strenthening is due to the development of the phase $Ni_3(Al,Ti)$ which is affected by the concentration of aluminum. There are 6 figures and 3 tables.

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S/590/62/105/000/015/015
I031/I242

AUTHORS: Tseytlin, V.Z., Candidate of Technical Sciences, Filatova, M.A., Eng. and Smirnova, V.A., Eng.

TITLE: Long-term (up to 17 000 hrs) testing of the heat resistance of the alloy ЭИ 765 (EI765)

SOURCE: Moscow. Tsentral'nyy nauchno-issledovatel'skiy institut tekhnologii i mashinostroyeniya. Trudy. v.105, 1962, 209-216

TEXT: The results of a stress-rupture test carried out for 17 000 hrs at 700°C and for 10 000 hrs at 750°C coincide, on the whole, with the results obtained by extrapolation in previous investigations. The specimens, machined from an electric-arc melt, yielded somewhat higher results than predicted, while in-

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Long-term (up to 17 000 hrs) testing...

duction-fused-specimens fell short of the extrapolated results. Metallographic inspection of ruptured specimens revealed intergranular fractures. Side surface of specimens tested for 10 000 hrs at 850°C were depleted of the main α'-phase elements, Al and Ti. A microscopic inspection revealed a considerable amount of precipitations, mainly titanium carbonitrides, located at the grain boundaries. At magnification of x 7500, the particles of the α'-phase were also seen. At 800°C, after 10 000 hrs, α'-phase particles may be seen at a magnification of x 1500, and at 850°C at a magnification of x 500. The time factor plays a decisive role in the growth of α'-phase particles, especially at their dissolution temperature. The structured changes in the EI765 alloy consist of the growth of α'-phase particle and fluctuations in their quantity. No new phases were found, hence the great stability of the EI765 alloy. There are 5 figures and 4 tables.

Card 2/2

TSEYTLIN, V.Z., kand.tekhn.nauk; KALUGINA, I.I., inzh.

Investigating the stress relaxation resistance of high-strength cast iron. [Trudy] TSNIITMASH 105:244-253 '62. (MIRA 15:8)
(Cast iron—Testing) (Strains and stresses)

BALAKHOVSKIY, O.A.; TSEYTLIN, V.Z.; CHUZHKO, R.K.

Dilatometric method for evaluating the preferential orientation of grains in deformed metals with a hexagonal lattice. Zav.lab. 28 no.10:1207-1208 '62. (MIRA 15:10)

1. Institut fizicheskoy khimii Akademii nauk SSSR.
(Metal crystals)

L 11302-63 EWP(q)/EWT(m)/BDS--AFFTC/ASD--JD

ACCESSION NR: AP3000487 S/0129/63/000/005/0031/0033

54

AUTHOR: Tseytlin, V. Z.; Drozdov, V. P.

TITLE: Tempering perlite steel at high temperatures

SOURCE: Metallovedeniye i termicheskaya obrabotka metallov, no. 5, 1963, 31-33

TOPIC TAGS: tempering; perlite steel, time reduction, (viscosity) toughness of steel, plasticity

ABSTRACT: Tempering of perlite steel in oil and salt baths at elevated temperatures and at greatly reduced periods of time was the problem studied by the authors. The steel used in this study was type 25Kh2 MIFB (EP43). Normally the required hardness of this type of structural steel was achieved at temperatures of 650C; the duration of the tempering period was 3 hours. In the experiment, the steel was heated to an elevated temperature and the same hardness was achieved at a greatly reduced period of time. At 700C, the duration of the cooling period was 20 minutes. At 750C the duration of the cooling period was 5 minutes. Therefore, by increasing the temperature by 100C, the cooling period was reduced 60 times. The authors conclude that by this method not only the same hardness was achieved, but also the plasticity remained practically the same, and the ductility of the steel was 3 times greater. This method is recommended for structural steel components which are not more than 16 mm in diameter.

Card 1/2

RADYUKIN, K.A.; TSEYTLIN, V.Z.

Properties of vacuum-refined ShKh15 steel. Metalloved. i term. obr. met. no.10:9-12 O '63. (MIRA 16:10)

MOROZOV, N.D.; TSEYTLIN, V.Z.

Determination of the relaxation characteristics of compression springs in testing a single spring. Zav.lab. 29 no.11:1354-1357 '63. (MIRA 16:12)

1. Moskovskiy vecherniy mashinostroitel'nyy institut.

L 10082-63 EWP(q)/EWT(m)/BDS--AFFTC--JD

ACCESSION NR: AP3001421 S/0136/63/000/006/0058/0063

56

AUTHOR: Dergunova, V. S.; Kolonin, Yu. G.; Tseytlin, V. Z.

TITLE: Investigation of sintered alloys of a ZrC-TaC system

SOURCE: Tsvetnyye metally, no. 6, 1963, 58-63

TOPIC TAGS: ZrC-TaC alloys, lattice parameters, solubility of components, room temperature microhardness, hardness at high temperatures, temperature coefficient of hardness, application, specific density

ABSTRACT: Eleven ZrC-TaC alloys, ranging from pure ZrC to pure TaC, were investigated. Mixtures of 90.13%-pure Ta, 96.0%-pure Zr, and C were compacted, sintered in hydrogen at 1400--2400C, crushed, and hot compacted in graphite dies at 2600--2700C under a pressure of 230 kg/cm sup 2. Alloys were then annealed at 2300C for 2 hr. X-ray diffraction patterns showed that the lattice parameter "a" increased linearly from 4.440 Angstrom for pure ZrC to 4.680 Angstrom for pur TaC, indicating the unlimited solid solubility of the components Microscopic examination also revealed only one phase in all alloys studied. Specific density increased continuously with increasing TaC content. Microhardness at room temperature decreased continuously from approximately 2170 kg/mm sup 2 for alloys with approximately 10% TaC to approximately 1400 kg/mm sup 2 for alloys with 90%

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ACCESSION NR: AP3001421

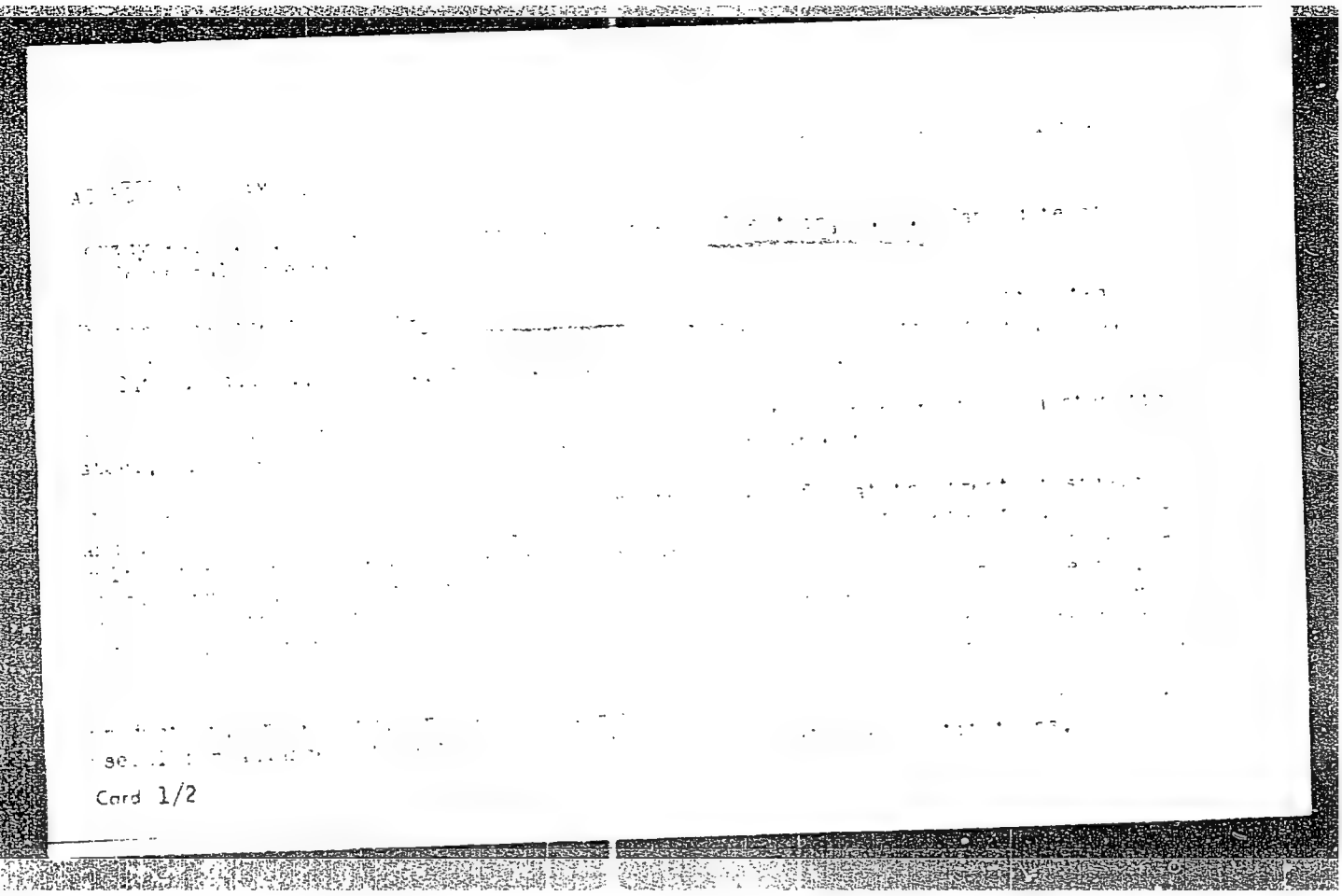
TaC. The hardness-composition curves at 450--1200C follow the same pattern as th of microhardness-composition at room temperature. The temperature coefficient of hardness at 700--1200C has the highest value in alloys with approximately 20% TaC and the lowest in alloys with 80--90% TaC. Alloys with 80--90% TaC also have the highest melting temperature and can be recommended for testing as structural materials for parts working at high temperatures in nonoxidizing media. Orig. art. has: 6 figures.

ASSOCIATION: none

SUBMITTED: 00 DATE ACQ: 09Jul63 ENCL: 00

SUB CODE: 00 NO REF SOV: 005 OTHER: 001

Card 2/2



Card 1/2

L 20087-65
ACCESSION NR AM4019547

3

TABLE OF CONTENTS [abridged]:

SUBMITTED: 06Jun64 NR REF SOV: 104

SUB CODE: MM

OTHER: 062

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ACCESSION NR: AP4010073 S/0129/64/000/001/0035/0040

AUTHORS: Tseytlin, V. Z.; Morozov, N. D.

TITLE: Relaxation stability of N36KhTYuM8 alloy

SOURCE: Metallovedeniye i termicheskaya obrabotka metallov, no. 1, 1964, 35-40

TOPIC TAGS: N36KhTYuM8 alloy, relaxation stability, prestressing, heat treatment

ABSTRACT: At 350°C without pre-stressing, N36KhTYuM8 alloy has an adequately high relaxation stability over a period of several hundred hours. By increasing the temperature to 400°C, this time is reduced by about 2/3. With careful selection of heat treatment conditions and with pre-stressing, springs made of this alloy will last over 500 hours and may be used above 500°C. After 500 hours the stress is reduced by 20%. The amount of pre-stressing should be maximum, but not exceed 0.8 of the yield strength; the duration of pre-stressing should correspond to the extent of the initial

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ACCESSION NR: AP4010073

portion of the relaxation curve and must be increased with increased temperature. Orig. art. has: 5 figures and 2 tables.

ASSOCIATION: none

SUBMITTED: 00 DATE ACQ: 07Feb64 ENCL: 00

SUB CODE: ML NR REF SOV: 003 OTHER: 000

Card 2/2

S/0148/64/000/003/0179/0184

ACCESSION NR: AP4022900

AUTHORS: Krupchatnikov, L. S.; Tseytlin, V. Z.

TITLE: Influence of surface cold working on the heat resistance of chromium nickel alloy

SOURCE: IVUZ. Chernaya metallurgiya, no. 3, 1964, 179-184

TOPIC TAGS: chromium nickel alloy, alloy EI617, cold working, heat resistance, tensile strength, isothermal heating, hardness ductility

ABSTRACT: This investigation of the influence exerted by cold working on the heat resistance of chromium-nickel alloy EI617 was undertaken in order to verify and expand the existing data. Cold work was applied by the ball-impact method described by M. I. Kuz'min (Novyy method otdelki poverkhnosti detaley naklepyvaniyem, Informatsionno-tekhnicheskiy listok N. 14, 1952. Vsesoyuznoye obshchestvo po rasprostraneniyu politicheskikh i nauchnykh znaniy). Flat and cylindrical samples were tested on a revolving table. By measuring the hardness on an oblique section, the depth of cold work influence was determined to be 0.9-1.0 mm. Surface hardness

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ACCESSION NR: AP4022900

exceeded core hardness by 41.4% and diminished with depth. The degree of cold work effect on the cylindrical samples was determined as the ratio: Volume (after cold work)/Volume (original) = 0.77. Residual compressive surface stresses produced by cold working were measured to be 51 kg/mm^2 by the method of N. N. Davidenkov (ZhTF, 1931, vyp. 1). The process of cold working also produced slip lines in the metal structure. The samples were heated isothermally and held at temperatures of 600-1000C for 100 hours. Some residual stresses persisted, even after 100 hours at 800C. Slip lines began to diminish at 800C and disappeared at higher temperatures. Phase separation along grain boundaries became more intense as the time of exposure to high temperatures was increased. The thickness of the hardened metal was not affected by treatment at 600C, but diminished greatly at 900C. After 100 hours at 1000C the hardness was uniform throughout the sample. The progressive diminution of hardness with increase of temperature is shown on Fig. 1 of the Enclosures. Cylindrical samples, 8 mm in diameter and 40 mm long, were investigated for their tensile strength, one part being tested in the original condition and another after cold working. Experiments were conducted at 600, 700, 800, and 900C. Time-to-failure and ductility (necking) were recorded. It was determined that cold working slightly lowers the strength of this alloy, as shown in Fig. 2 of the Enclosures.

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ACCESSION NR: AP4022900

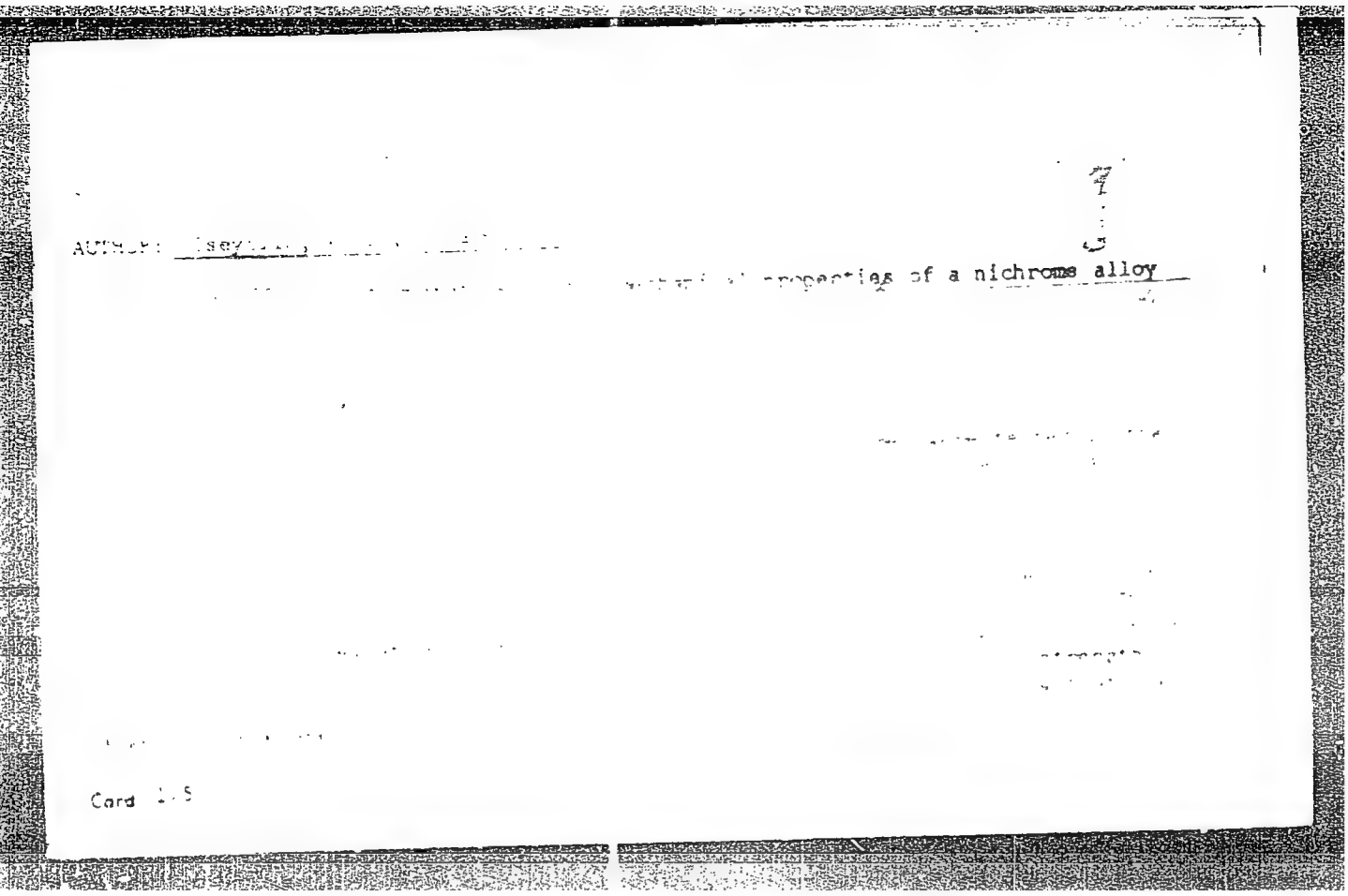
The influence of cold working on the ductility is more pronounced, but diminished at higher temperatures. The relation between the temperature and necking is presented in Fig. 3 of the Enclosures. Orig. art. has: 8 figures.

ASSOCIATION: Moskovskiy institut elektronnogo mashinostroyeniya (Moscow Institute of Electronic Machine Construction)

SUBMITTED: 22Apr61 DATE ACQ: 10Apr64 ENCL: 02

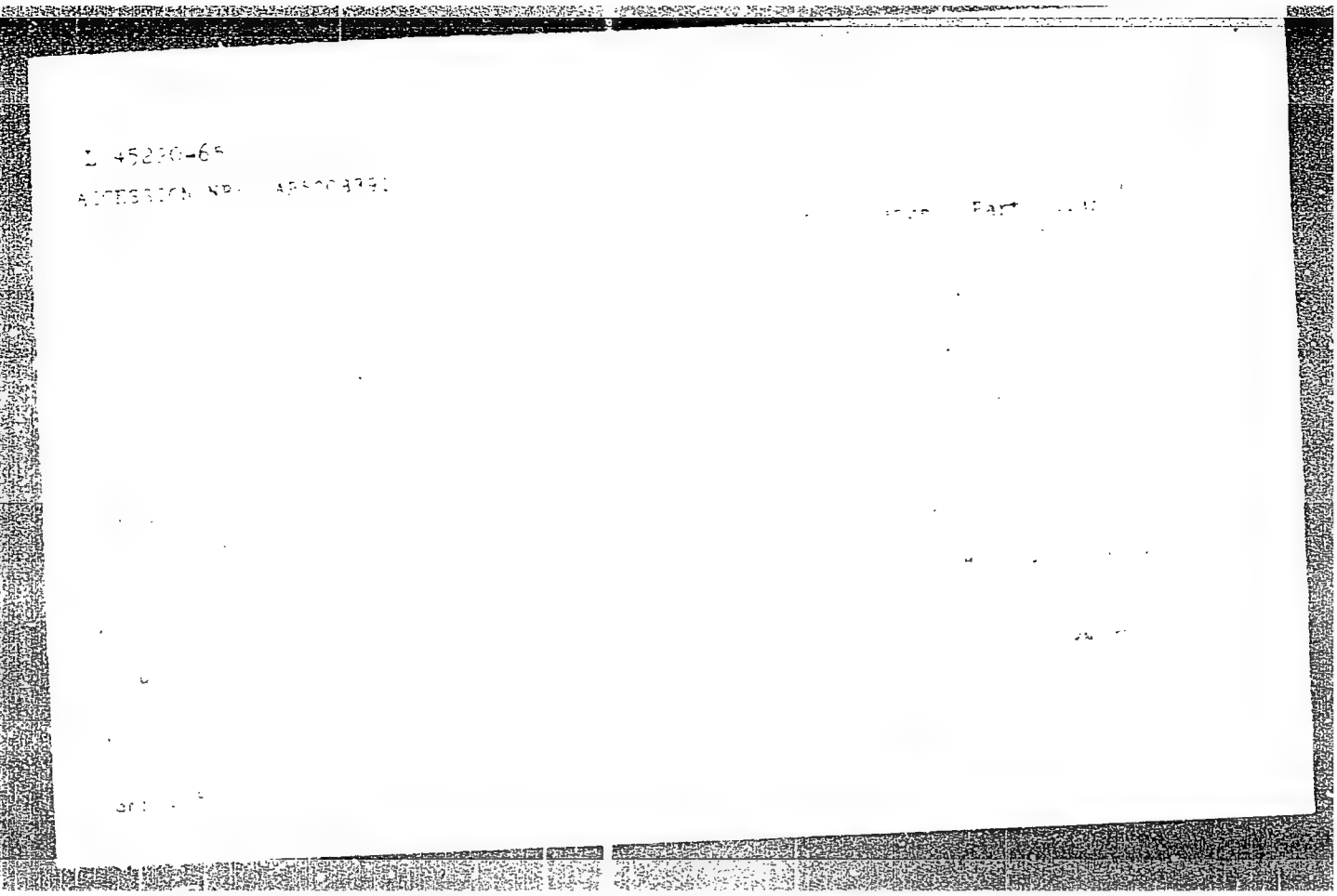
SUB CODE: ML NO REF SOV: 005 OTHER: 000

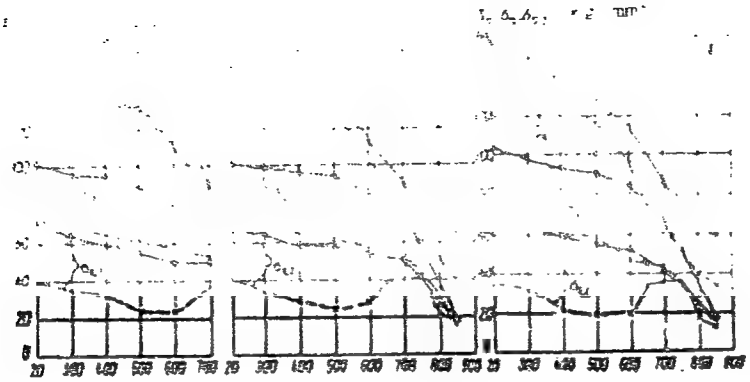
Card 3/5



AUTHOR: [illegible] properties of a nichrome alloy

Card [illegible]





Temperature, °C

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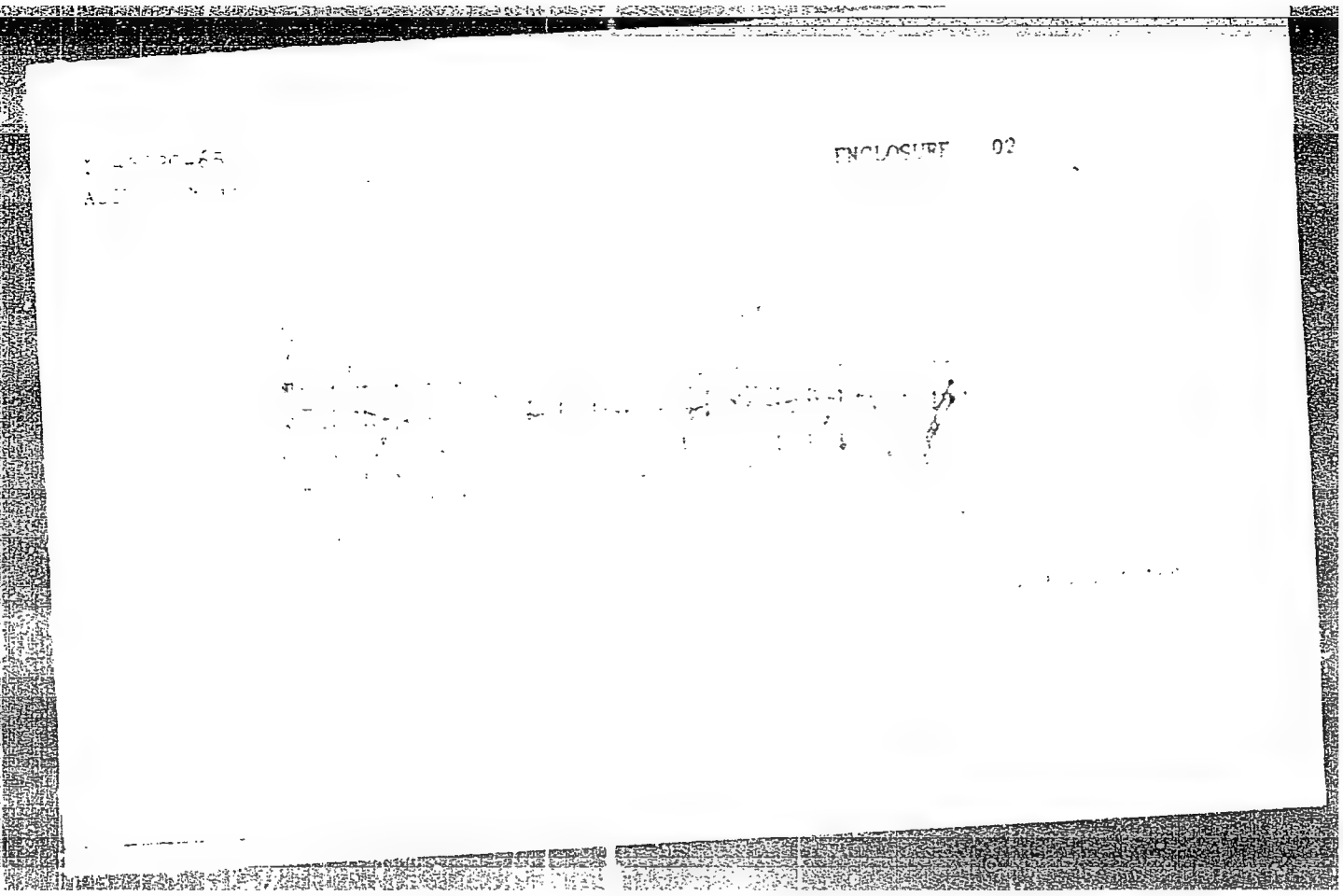
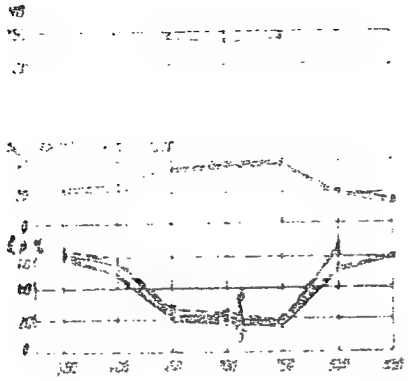


ENCLOSURE 02



ACC NR: AP7002845 SOURCE CODE: UR/0136/66/000/012/0084/0086

AUTHOR: Dergunova, V. S.; Timonin, P. L.; Kuzin, A. N.; Tseytlin, V. Z.

ORG: none

TITLE: Properties of tantalum diboride-zirconium diboride alloys containing chromium

SOURCE: Tsvetnyye metally, no. 12, 1966, 84-86

TOPIC TAGS: alloy composition, hardness, porosity, metal melting, chromium containing alloy, tantalum base alloy, boride, zirconium base alloy

ABSTRACT:
TaB_2-ZrB_2-Cr alloys containing 20, 25 and 30% of ZrB_2 and 3—10% Cr were obtained from ZrB_2 (79.6% Zr, 19.67% B, 0.01% C) TaB_2 (89.18% Ta, 9.97% B, 0.01% C) and 99.9%-pure Cr powders by compacting at 2100—2200C under a pressure of 220 kg/cm^2 and homogenization at 2000C in an argon atmosphere. Depending on the composition, the porosity of alloys varied from 0.5 to 3—4%. The alloys consisted mainly of a solid solution of zirconium boride in tantalum boride with a microhardness of 2900—3300 kg/mm^2, and a solid solution of chromium boride in tantalum boride with a microhardness of 1000—1200 kg/mm^2. In addition, fine grains of a third phase,

UDC: 669.294/296

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ACC NR: AP7002845

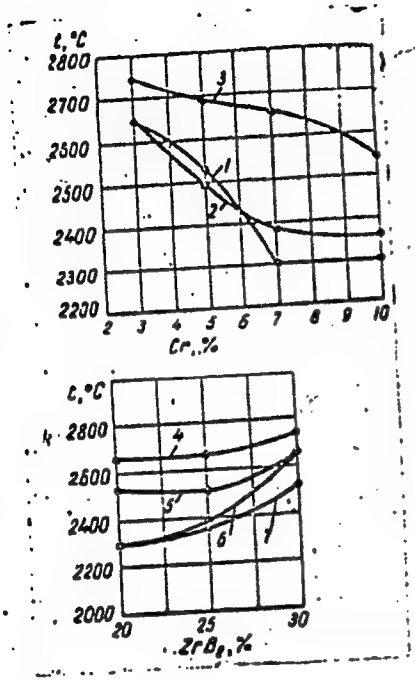

Fig. 1. Composition dependence of the melting point of TaB_2-ZrB_2-Cr alloys

TaB_2:ZrB_2 ratio: 1 - 80:20; 2 - 75:25; 3 - 70:30; Cr additions: 4 - 3%; 5 - 5%; 6 - 7%; 7 - 10%.

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ACC NR: AP7002845

probably chromium boride, were observed along the second phase grain boundaries. The composition dependence of the melting temperature of TaB_2-ZrB_2-Cr alloys is shown in Fig. 1. Increasing the chromium content from 3 to 10% lowered the strength (hardness) of the alloys both at room and at elevated temperatures, but increased their oxidation resistance. Orig. art. has: 5 figures and 1 table.

SUB CODE: 11/ SUBM DATE: none/ ORIG REF: 007/ OTH REF: 005/ ATD PRESS: 5113

Card 3/3

GULYAYEV, V.N., kand. tekhn. nauk; TSEYTLIN, V.Z., kand. tekhn. nauk; RYABOVA, L.I., inzh.; TALOV, N.P., inzh.; BULANOV, Yu.P., inzh.

Effect of the duration of the heating on the structure and properties of chromium-manganese-nickel steels. Teploenergetika 11 no.8:54-57 Ag '64. (MIRA 18:7)

1. Vsesoyuznyy nauchno-issledovatel'skiy teplotekhnicheskiy institut i TSentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii.

TSEYTLIN, Ya.A.

Clinical evaluation of nonroentgenological methods of treating trichomycosis. Sov. med. 26 no.4:95-97 Ap '63. (MIRA 17:2)

1. Iz mikologicheskogo otdeleniya (zav. Ya.A. TSeytlin) 3-y Luganskoy gorodskoy bol'nitsy (glavnyy vrach A.T. Chumakova).

TSEYTLIN, Ya.I.; YERSHOV, I.A.

Lowering the seismic effect of a blast in short-delay blasting. Trudy Inst. fiz. Zem. no.21. Vop. inzh. seism. no.6:103-114 '62. (MIRA 15:9)

(Blasting)

TSEYTLIN, Ya.I., inzhener; KRYUCHKOV, V.V.; TIKHANOVSKIY, V.I., inzhener.

Investigating the seismic effect of blasting at the Tyrny Auz mine.
Gor.zhur. no.9:32-37 S '57. (MLRA 10:9)

1. Proizvodstvenno-eksperimental'noye upravleniye Soyuzvzryvproma.
(Tyrny Auz (Kabardia)--Blasting) (Seismic waves)

TSEYTLIN, Ya.M.

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Berkiayd, I. M., V. S. Vikhman, A. T. Draudin, N. Ye. Kopanevich, G. I. Ovcharenko, Z. L. Tubenshlyak, G. V. Chasovnikov and Ya. M. Tseytlin

Kontrol'nyye avtomaty ([Dimensional-] Control Automatics) Moscow, Mashgiz, 1961. 193 p. (Series: Progressivnyye sredstva kontrolya razmerov v mashinostroyenii) Errata slip inserted. 4500 copies printed.

Eds. of Series: B. S. Bayburov, M. I. Kochenov, and D. D. Malyy; Scientific Ed.: V. S. Vikhman, Doctor of Technical Sciences; Ed. of Publishing House: L. P. Stroganov, Engineer; Tech. Ed.: R. I. Dobritsyna; Managing Ed. for Literature on Means of Automation and Instrument Construction: N. V. Pokrovskiy, Engineer.

PURPOSE: This book is intended for designers and technical personnel in machine plants.

Card 1/3